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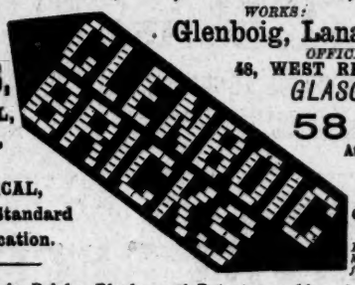

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VOL. CLVIII., No. 3080.] WEDNESDAY, MAY 24, 1922. [74TH YEAR.

EDITORIAL NOTES.

A Question of Public Policy—The Manchester-Stretford Case.

THE Stretford Gas Bill was down for consideration by a Committee of the House of Commons yesterday, having already been passed by a Lords Committee, as reported in the "JOURNAL" for April 5. The Bill, it will be remembered, is to constitute a Joint Board to take over from the Manchester Corporation the Stretford gas undertaking, which passed into their possession, through the powers conferred by the Corporation Act of 1921. In that measure, however, a purchase clause was inserted in favour of the authorities, or any two of them, in the area of supply of the Stretford Company. In this article we are not dealing with the proceedings before the House of Commons Committee; but it seems to us that what is happening in connection with this Manchester and Stretford business is an excellent illustration of certain weaknesses in our legislative policy and Private Bill procedure. Parliamentary enactments are supposed to be for the public good. That is the excellent intention; but the intention sometimes fails.

The question arises: Will the consumers in the Stretford Company's area be in a better position under the Joint Board than they would under the Manchester Corporation? We will deal with the point presently. The same question, however, bears upon the subject of Private Bill procedure in the case of a Purchase Bill such as this of Stretford. The point was dealt with editorially in our issue for April 5. In this instance we have a notable illustration of the error of parliamentary convention in definitely prohibiting, when a purchase clause is inserted in a Gas Act, the parties who are to be dispossessed of their newly acquired property giving reasons against such a course in the interests of the consumers affected. Self-determination on an economic matter —not a political one—about which the ratepayers know very little or nothing, is not always good; and when new evidence is prohibited that could be adduced before a Committee who have not even heard the evidence given in the previous session, it is wholly impossible for the Committee to say whether or not the interests of the public would best be served by the transfer. It is particularly so in this case. On general grounds, one could with considerable assurance say that the consumers in the Stretford Company's area could be better served by Manchester than by a smaller joint authority such as is now contemplated. Apart from those general grounds, since the evidence on the subject was given in 1921, there have been considerable changes in economic conditions, which will be of advantage to gas supply generally, but more so to an undertaking of the dimensions of that of Manchester than to a smaller one such as will be that of the Stretford Board—if formed. On these grounds, we think that in the public interests, the prohibition against evidence being adduced by one of the parties (save where their own particular interests are affected) is altogether wrong; and no Committee of Parliament should be limited in the evidence they should hear, and so be prevented from arriving at a decision on the broadest possible basis. Moreover, the modern policy of Parliament is to promote consolidation of public utility concerns, with the view to more economical working, and so to the benefit of the public. This is so in the case of railways, water undertakings, and electricity concerns, and the Gas Regulation Act, sub-section *d* of clause 10, also favours consolidation. But here is a case where, following old precedent, Parliament are deliberately ignoring their own recently instituted policy, and this (again following old custom) without making full investigation in the light of to-day's conditions. This is one of those parliamentary enigmas which no one can properly understand, and therefore no one can solve.

In this matter, a peculiarity of Parliament is to invest an authority with certain powers, and in a few months to divest them of it; but, in this instance, there does not appear, in the interests of the people most concerned, any rational ground for doing so. That is the pity of it. Ignorance is unquestionably at the bottom of this particular business as between Manchester and Stretford. We know a good deal of the Manchester gas undertaking, know its position, know something of the scheme for new gas-works promoted solely with the view of creating more economical manufacture; but did we, notwithstanding, believe Stretford could do better than Manchester in the way of cheap gas production, we, being perfectly disinterested, would say so without hesitation. Let us just run lightly over the facts. The Manchester Corporation have had to look farther afield for a new site for gas-works. The one chosen is on the banks of the Ship Canal in proximity to the Partington coal basin; and at a point on the main railway line along which coal can be brought from any of the English coal-fields, and it is to-day so brought for shipment. Supplementary to this is the fact that the main railway line is elevated above the surrounding country, for the purpose of crossing the Ship Canal—thus giving the advantage of a high-level railway into the new works. Moreover, the bulk of the land was already the property of the Corporation. Everything suggests, as Alderman William Kay (the Chairman of the Gas Committee), Mr. William Newbigging, and other gas experts have said, that the site is an ideal one for a super gas-works—another Beckton, only a Beckton planned and laid out in conformity with the advanced gas-engineering knowledge of to-day. The one thing that militated against it was that, lying between it and the city of Manchester, was the area of gas supply of the Stretford Gas Company. The opportunity arose for purchasing the undertaking—*post*-war conditions making this indeed a peculiarly fitting time—and the Corporation availed themselves of it. Hence, combined with the Partington scheme, the reason for the Corporation Bill and Act of 1921, in which—we think unfortunately—a purchase clause was inserted in favour of Stretford, Sale, Urmston, Ashton-on-Mersey, Barton-upon-Irwell and Bucklow. These District and Parish Councils, or two or more of them, were designated to form, if thought fit, a Joint Gas Board for the Stretford Company's area. When polls of the ratepayers in the several administrative districts were taken, only two of the authorities—Stretford and Ashton-on-Mersey —received the sanction of the ratepayers to proceed; but, in spite of this, the constituent authorities have persisted in the promotion of the Bill.

Now it is interesting to examine the matter from the point of view of the gas consumers in the Stretford Company's area. Will they benefit monetarily from being supplied by a Joint Board rather than by the Manchester Corporation? Has any Committee of Parliament considered this, or will they have an opportunity of considering this, adequately from the point of view of the gas consumers in the area? We think not. The Manchester Act of 1921 gave those consumers an immediate relief of 8d. per 1000 c.ft. They were brought at once to the position as to price, free cookers, free fixing, and very low hiring charges for other apparatus, that obtain in the City of Manchester. This, to them, valuable condition of affairs came into force on Jan. 1 this year; the Company's price then being 5s. per 1000 c.ft., and the Manchester charge 4s. 4d. On April 1 there was a further reduction of 4d.; so that then the price was 4s., as

against the Company's former 5s. It is only due to the consumers in the Stretford Company's area that they should be made fully aware of the (for them) anomalous position created by the suggested Joint Board.

The main question to-day is what chances there are of the Joint Board being in the position to serve the consumers in the Stretford Company's area as well as Manchester with all its exceptional resources. All the expenses to which the Joint Board will be put would have been merged in the extraordinarily larger business done by the Manchester Corporation, so thinning down to a much finer point those charges per 1000 c.ft. We have seen no satisfactory case yet which persuades us that the Joint Board in their circumstances will be able to do for the consumers in the Stretford and neighbouring area what the Corporation can do in their circumstances—now and hereafter. We have seen what has already happened in regard to price. Will the Joint Board be able to keep pace with Manchester in causing the price further to recede? If not, then we say emphatically the Joint Board ought not to be brought into being. Their obligations will be heavy; and we doubt whether the consumers appreciate that the Board will have in the gas consumption a narrower and shallower base for those obligations to rest upon than the Manchester Corporation would have—the latter, too, with its low capital per million c.ft. According to the Corporation Act of 1921, the Joint Board will have to repay the Corporation the purchase price, *plus* all additions in the shape of mains, services, cookers, apparatus, and improvements which have been agreed to by the Joint Board. The purchase price was £285,000, *plus* £10,000 of debentures, and these sums, with incidental costs, make a round figure of £300,000. To this has to be added the purchase of the Salford Corporation's interests in the supply of Davyhulme (£7000), as well as the mains and services to the various authorities' housing schemes, amounting to probably £25,000. Then a new main is requisite to supply the portion of the Salford area already referred to. When all is taken into account, the Joint Board will have a charge to face amounting approximately to £400,000. Assuming a loan period of thirty years—and it is certain the Joint Authorities will not be able to do better than Manchester in this respect—it is apparent that the interest and sinking fund charges alone will be about £32,000 a year. A perusal of the accounts of the Company discloses the fact that, with their economical and careful management, they were able to earn their maximum dividend which amounted to £10,500. And this with gas latterly at 5s. per 1000 c.ft. How the Joint Board are to face the sinking fund and interest on the already accumulated obligations, together with necessary capital expenditure for modernizing the Stretford works, with gas at the Manchester price, is a problem which it will be for them to solve, or confess to the consumers that they have betrayed their interests. It may be added that the main from the Partington works (where 40 million c.ft. of gas per day are going to be made under economical conditions) will pass within a few hundred yards of the Stretford works; and there will be gas flowing through that main which will, expert opinion declares, be produced at a cost 1s. less than it will be possible for Stretford to make it at the works situated in a residential portion of the Stretford area, with no railway facilities whatever—at present the coal has to be carted from the railway station; only a portion arriving in barges by the Bridgwater Canal.

These are all facts the consumers in the Stretford area should have brought home to them. We are perfectly disinterested. Beyond being a matter bearing upon good gas policy and the best interests of the gas consumers, we are not concerned whether the Stretford area is supplied by a Joint Board or by a Corporation. It is, however, a matter of concern to us that the best possible gas policy should be adopted in any particular area. We share the opinion of those who believe the future will prove that Parliament, and a majority of the ratepayers of Stretford and Ashton-on-Mersey who voted on the question, have made a mistake. We shall see. If our anticipation proves correct, the erroneous policy will be due not to a present strong belief that Stretford, under a Joint Board, can vie with Manchester in the matter of gas charges, but to jealousy and the fear of a later scheme of annexation. The only point that Parliament had at present to consider was, On which side lie the best interests of the Stretford gas consumers? That question Parliament has not answered, and has insufficiently taken into consideration. Therein is a defect in our Private Bill procedure.

Annual Report of the Livesey Professor.

The annual report of Prof. John W. Cobb, Livesey Professor at the Leeds University, appears in other columns to-day. Never have we read, with greater satisfaction, nor with greater sympathy, a report on the work of the Department of Coal Gas and Fuel Industries. The Department has become something more to the gas industry than a necessary educational institution. It has entered into the technical life of the industry with a great deal of verve, a growing efficiency, and an increasing usefulness. Filtering into that life from the Department are men with new qualifications and research work of material value. We cannot—looking to the responsibilities and the needs of the future, as they who are sentient can fashion them in their minds—appraise all this too highly. A new spirit, a new height in ambitions, a longer reach of foresight, a better conception of need are to the observant notable changes (if not yet universal) in the gas industry; and not a small part of these fresh aspects of our industrial affairs is attributable to the Department which was founded as a memorial to one of our greatest leaders. We have only to look over our modern technical literature to see the proof of this, by comparison with what went before. Only recently we met a gas engineer who retired but a few years ago, and in his retirement has not followed so closely as beforetimes the progress of the technical work of the industry. Though his position was high in his day, he with all seriousness confessed that in gas practices and knowledge he was a "back number," and that, casually picking up a "Journal," he found that a long abstention from reading had caused a sort of mental hiatus which made much of the technical literature incomprehensible to him. He had been trained in his day as an engineer, and had successfully practised as one; but his chemical and physical knowledge of gas manufacturing and secondary product processes, and of the applications of gas and other products, was of meagre quantity. He owned to the deficiency.

New men and new methods are coming along. Everything has to have a beginning. The nascent stages of the work of the Department of Coal Gas and Fuel Industries (interrupted in growth by the intervention of war) have been passed; and now better appreciation is providing more young men, and work in training and in research of great scientific utility is proceeding, and expanding. The ideal is to show accretions of usefulness year by year; and in this Prof. Cobb is meeting welcome success, to the advantage and gratification of those in the gas industry who have its best interests at heart, and in that gratification Prof. Arthur Smithells, a staunch friend of the industry, shares. Many of the young men who have passed through the Department are to-day the holders of positions of responsibility in either the gas-supply industry or in the works of the manufacturers of gas plant and gas-using appliances. There is no difficulty in placing them when their period of university study and research has been spent, which study and research is now mingled with works' experience, for which Prof. Cobb in his report thanks various gas companies, corporation gas departments, and others connected with the coke-oven and fuel industries. These men will have their influence in the gas industry. They are the bearers of that higher standard of qualification which is more a necessity to-day than ever; and their presence in the industry will have an invaluable influence. The figures given in the report are promising as to the supply continuing. A net difference of two or three new entries as between one year and another is not worth noting, particularly when the word "congestion" has to be used, towards the relief of which, and to help to meet the higher expenses which the times and the carrying of the work of investigation into new avenues involve, certain contributions are specified in the report. We should like to have seen a longer list than the South Metropolitan Gas Company, the South Suburban Gas Company, and Mr. A. G. Glasgow, the personal gift of the last of whom is in accord with his advocacy throughout his connection with the gas industry of the need for a greater amalgamation of scientific knowledge with its everyday practices. There have also been gifts to the Department of apparatus and samples of various kinds which are useful in prosecuting its work, and particularly in developing research.

The educational part of the work of the department has been developed as experience has directed and needs have commanded. The lectures, too, which are distinct from the normal day-by-day courses, are a growing attraction. Re-

searches by enthusiastic men are opening-up in new directions. The annual report, in short, is a record of vitality that speaks for itself; and underlying it all we find, without express mention, the earnestness of Prof. Cobb, his chief assistant (Mr. H. J. Hodsman), and the staff of diligent research chemists, with several of whom the gas industry has made acquaintance, to its lasting benefit.

Industries and the Work of the Universities.

THE foregoing and Prof. Cobb's report indicate how much the gas industry has now in its development to rely upon applied science. The Department of Coal Gas and Fuel Industries is by its work cultivating among the men of the industry a deeper interest than before in the doings of our higher scholastic institutions—such as the Leeds, Birmingham, Manchester, and other universities—where much of the work that is carried on is allied with industrial practice and advancement. Therefore, no excuse is needed for drawing attention to two or three points that arise out of the recent conference of representatives of the universities of Great Britain and Ireland. Such conferences, it is intended, are to become annual ones; and there is scope for them. From the recent conference, one thing strikes the observant and interested reader as being of imperative moment, and this is that the work of the universities should be placed on a systematic basis—both collectively and individually. In one paper, we had Dr. J. C. Irvine (St. Andrews) eloquently putting forward the need for the provision of enlarged opportunities for advanced study and research in the universities; and, on the other hand, we had Dr. L. R. Farnell (Oxford) expatiating upon the need for specialization in definite subjects of study by certain universities. With both advocates one can readily agree, simply by applying as the test of the validity of their submissions our own experiences in the gas industry.

Research, as Dr. Irvine says, is vital to our industries; and our development as a nation would be improved if, in addition to the solitary investigator, we had an organized effort whereby facilities were made available to all who were capable of profiting by them. This brings us up against the problem of ways and means; and, as research is a matter of both industrial and national importance, then it follows that the ways and means of developing research is a question for the joint consideration of industry and the Government. Dr. Irvine also submitted that higher study should be controlled within each university by a board or standing committee. With this, too, we willingly agree, but should advocate an extension of the constitution of the board or standing committee (if this was not contemplated by the author) to the inclusion of representatives of the industries concerned. Dr. Farnell advocates specialization by the universities, which means attachment to specific industries without attempting to compass in one university the whole gamut of industries. In this, too, there is concurrence; and in order to attain the highest efficiency and the maximum good from the work, we would suggest that an advisory committee such as obtains in connection with the Coal Gas and Fuel Industries Department of the Leeds University should be instituted in connection with the specialized work of each university and in each department, and the advisory committee should have incorporated in it technical representatives of the industries themselves. The welding of science and practice should begin at the beginning; the fusion should not be of a *post*-academical order. Where this is the case, there must be a loss of efficiency, and the maximum good will not be realized.

As to specialization by the universities, Dr. Farnell says it is getting a physical and financial impossibility for every university to touch all subjects now that knowledge has put forward so many new shoots. It is not only getting, but it is actually, a physical and financial impossibility for every university to deal with all subjects; but, of course, there are various theoretical matters—chemical, physical, engineering, &c.—that are the bases of all technical training; and therefore all universities must take them up. But when we go beyond fundamental knowledge, and get to application, then specialization becomes important; and it is there that there should be a parting of the ways as between one university and another. At the same time, Dr. Farnell warns against over-specialization in the case of any university. We do not know exactly what he means by "over-specialization," not having had the advantage of perusing a complete copy of his paper. For our own part, we should strongly object to a limited specialization—our experience of the Coal Gas and Fuel Department of the Leeds University being that one development leads to another, and therefore there is not the least desire on the part of the industry to circumscribe the department in broadening out its work.

The limitation to special branches in each university is quite another matter; and it is an aspect of university reorganization that appears to commend itself to Mr. Fisher, the President of the Board of Education. At the conference he said that the development of applied science in the Universities has arrived at such a point that it is quite impossible for the nation as a whole to advance unless there is a higher degree of co-operation between the universities in respect of the distribution of studies than has hitherto been thought necessary. The universities must husband their resources by co-operation and agreement. It seems to us that the conditions render this imperative; but, of course, it has a drawback, in that specialization in subjects by the universities must place such educational advantages beyond the reach of some students (through insufficiency of means) in any one particular branch who are situated in parts of the country distant from the university. At the same time that disadvantage has to be set against the advantage of specialization, which enables a university the better to husband its resources. Mr. Fisher advises that the universities should in this matter take counsel with each other, and so systematize their work as much as possible. There can be little question that this would add to efficiency and maximum good in respect of any particular branch of applied science. No one wishes to see a university where applied science is the feature, a "jack of all trades," and master of none.

It was also intimated by Mr. Fisher that this would be a matter in which the University Grants Committee would be concerned. That Committee might be asked to do its best to allocate Government grants upon an economical plan, and with regard to the specialist aptitudes of particular universities; and thus the universities would be helped to realize the federal idea. It is clear that Mr. Fisher has his eyes set in this direction; for he suggests that the Committee might inquire into certain other things: For instance, what specialist departments requiring new endowments were appropriate to particular universities. The Government wanted to know what new developments they ought to encourage in particular universities; and it is desirable if possible to avoid duplication, and so waste of funds. A second inquiry would be as to whether the existing funds of particular universities could be applied to better uses within them; and a third inquiry would be as to whether the statutes of the different universities could be so altered as to facilitate the migration of particular students, either during or after the university course, in order to obtain the advantages of specialist teaching in other universities. From all of this, it will be seen how intimately the interests of the industries of the country are becoming bound up with those of the universities.

Tar Distillation for the Smaller Gas-Works.

A GREAT deal of attention is being given by investigators to the provision of a simple working tar-distillation plant, which will not require much supervision, and will be reasonably cheap in installation, for tar-producing works of the lower magnitudes. Tar distillation, through the costliness of the plant, and the amount of expert supervision required, has been looked upon as within the scope only of the larger works; but simplification of process may entirely alter this state of things. It was seen in our issue of May 10 that Mr. S. A. Wikner, of Newcastle-on-Tyne, has been working in this direction; and he appears to be directly utilizing the heat of steam for treating the tar, and effecting the separation of the different grades of products. We have to wait a little time to learn more exactly the details of the process, which are the subject of an application for a patent. But can it be that Mr. Wikner in this country has been working on the same lines as M. Ch. Ab-der-Halden in France? As the interesting translation in last week's issue showed, the latter, too, has been operating with the view of developing a process of tar distillation by employing the heat of steam (superheated), which can economically place moderate sized and smaller works in a position to treat their own tar, and escape the obstacles that have hitherto confronted works other than large ones in entering upon the process of tar distillation. Laboratory work corroborated

the view that the volatile portion of tar will yield to distillation by steam passing through it. This being proved, the process he has developed is volatilization by steam, followed by fractional condensation into commercial products. The process appears from the description to be quite simple; and we shall be interested in time to see the results of the actual operations in the three works which respectively treat 100, 1000, and 4000 tonnes of tar a year.

Running lightly over the plant and the procedure cycle, the tar is passed into a filter, thence into a settling-tank, and flows on to a dehydrator—a tubular condenser maintained at a temperature of over 100° C. by the products of the distillation, which in itself is an obvious economy. The tar, having thus parted with its water and light oils, flows into a still, comprising a retort heated to the desired temperature, with a column above in which the tar trickles down over packing. Superheated water-vapour passes right through the still from the bottom to the top, and causes volatilization of the fractions corresponding to the working temperature. Separation and condensation follow, in which the anthracene oils are yielded up. The temperature at which the volatiles and the water vapour leave the still is between 150° and 170° C. In the immediate subsequent separation and condensation, the temperature falls by 20° to 30° C.; so that the remaining vapour mixture has still a temperature of 130° to 140° C. This enters the dehydrator, and is further cooled by giving up its heat to the crude tar undergoing dehydration. Here the mixture falls in temperature to 100° C.; and this admits of the heavy oils being condensed out. Further condensation follows, and the middle oils are separated. In the final cooler the lights are run off. Thus the crude tar is fractionated into five parts—pitch, anthracene oils, heavy, middle, and light oils. This method of procedure is a reversal of the usual order—the condensation being graded down to finish with the lightest volatiles. By the process the inventor claims that tar distillation is brought within the reach of most gas-works. The patent specification for the process is noticed in our "Register of Patents" to-day.

Now it will be interesting to hear what Mr. Wikner has to say, as early as he is at liberty to make further publication. Meanwhile, we would suggest that an eye should be kept on the process for treating liquid and solid materials at successively different temperatures which was described in our "Register of Patents" on March 8 last [p. 582]. In one form of this process, there is treatment of liquid or solid material in successive separate baths of molten metal having different temperatures. This is a system of operation for which the Thermal Industrial and Chemical Research Company, Limited, Sir Arthur M. Duckham, and Mr. J. S. Morgan are responsible. Then Mr. Thomas Wilton (as a paragraph to-day shows) is also the inventor of a new process, which has heated and successfully distilled a large quantity of tar giving an average residue of only 27 p.ct. of pitch, when normally 44 p.ct. would be expected. A 50-ton per day plant is working at Glasgow; and notable results have been obtained with tar having a 10 p.ct. water content. Tar distillation is deriving a new interest from the activities of workers in various directions.

Stretford Gas Bill.

It will be seen from our "Parliamentary Intelligence" that this Bill is to meet considerable opposition in the House of Commons. Important consumers of gas, as well as ratepayers in the area of the proposed constituent authorities, are opposing. There are evidently fears that the price of gas will be higher under a Joint Board than under the Manchester Corporation; and that the prospects of deficiencies under the proposed Board are not so remote that they may be regarded as negligible.

Gas Coal Markets.

There seems a growing tendency (which reminds of pre-war times) for invitations to be made for competitive tenders for the supply of gas coal; and this applies not only to the big gas undertakings, but to those of smaller dimensions. At the same time, in some of the coal districts there is such an amount of gas coal now at liberty on the markets, that undertakings are able to buy-up good spot quantities. One condition which enables this to be done is the fact that, although the consumption of gas is being about maintained for the time of the year, there is a considerable reduction from the maximum; and therefore there is no particular pressure for deliveries. Another feature of the current position is that gas undertakings are paying considerably more attention to the purchase of washed and screened varieties of coal. This can be well understood, in view of the economy derived from putting the carbonizing plant to the most efficient use. Good class coal increases the output per unit of plant, results in lower fuel accounts, and improves the physical characteristics and quality of the coke. In the Durham district, it is reported that orders for coal from abroad are well maintained; and there is a fairly considerable demand for second-class grades of gas coals for use overseas. The price is round about 21s. 6d. per ton. Germany is a substantial buyer just now of both the best and the second grades.

Position of the Coal Industry.

An interesting statement was made the other day by Mr. Bridgeman when the House was sitting as a Committee of Supply, and was considering a vote of £95,284 for the salaries and expenses of the Mines Department. Among much else he informed the House that the staff of the Department has been reduced since July, 1920, from 683 to 361, and the expenses have come down in a correspondingly satisfactory manner. It was likewise, in several respects, a very good tale that Mr. Bridgeman had to tell regarding the position and prospects of the coal industry. There are now fewer fatal accidents per million workers in this country than in any other, save Belgium. There has also been a wonderful recovery in the export trade; we have obtained new markets, and have recovered many of those that were lost to us. By the way, Germany is now buying coal from this country in pretty considerable quantities—some of it being required for gas-making purposes. Then the output of coal per man employed per shift has improved, and is now something like 1 ton. Mr. Bridgeman agrees that wages and profits in the coal industry are not what they should be; but he looks hopefully to a revival of trade making some adjustment in this respect. The wages question is aggravated by the large amount of unemployment and short-time working that there is in the industry. The miners' representatives are pressing this matter to the front; but they are scrupulously careful not to place any part of it to the tragic results of the policy of their Federation last year, when so many industries were crippled, and have never yet recovered from what was then experienced, combined with subsequent disturbances in other industries. Trade union policy and industrial prosperity have large association; but when policy is not conducive to prosperity, and has an ill-effect, little is heard of it from the trade union side. The grumbling, however, goes on.

Coal Exports.

The total of the coal exports in April was 4,096,578 tons; in the same month last year, the figure was 606,548 tons; and in April, 1920, 1,995,895 tons. There we have corroboration of what Mr. Bridgeman said. Of the quantity of coal shipped last month, 256,618 tons went to Germany. Looking at the analyses of the classes of coal, it is seen that 580,855 tons were classified as "gas coal," which figure compares with 91,037 tons in April, 1921, and 120,325 tons in April, 1920. The value of the 580,855 tons was £644,742, or an average of about £1 2s. 2d. per ton. In the four months of this year, the quantity of gas coal shipped was 2,456,321 tons, of a value of £2,726,820. In the same period of last year, the quantity was 941,805 tons, of a value of £2,433,040. In the corresponding months of 1920, the quantity was 755,593 tons, of a value of £2,818,074.

Exports of Gas Coke.

In April, 43,540 tons of gas coke were shipped, with a value attached of £64,361, or an average of £1 9s. 6d. per ton. In the same month of 1921, 28,631 tons were exported; the value of the smaller quantity being nearly as much—£62,685. In April, 1920, 45,391 tons were sent abroad; the value being £245,837, or an average of £5 8s. 6d. per ton. In the first four months of this year, 269,608 tons of gas coke were shipped, the value being £409,407. In the corresponding period of 1921, the quantity was 200,342 tons, with a value of £531,571 attached. In the like period of 1920, the quantity was 262,968 tons; the value, £1,251,524!

Sulphate of Ammonia Exports.

There was a little brightening-up of exports of sulphate of ammonia in April—the quantity being 8951 tons, compared with 7422 tons in April, 1921. The shipments during the four months have been 50,424 tons, compared with 59,735 tons in the corresponding period of 1921.

The Electricity Bill.

Misfortune dogs the steps of the Electricity Supply Bill. In the House of Commons, the debate on second reading was commenced on Monday of last week. The motion was introduced by Mr. Neal, Parliamentary Secretary to the Ministry of Transport; and its rejection was moved by Mr. G. Balfour, who regards the proposed joint authorities and the suggested methods of finance as bad public policy, which will lead not to progress and prosperity, but to stagnation. Other members also look upon certain of the clauses as very dangerous from the point of view of the economical production of electricity. There were several speakers *pro et con*; and the debate stood adjourned. Up to the time of going to press we have been looking for its resumption.

Rating of Machinery Bill.

There seems to be a general disposition to allow this Bill to go through. Its principle is approved, but there are some people who would like certain amendments; and so Sir H. Kingsley Wood has expressed his willingness to confer, before the report stage, with any authorities or committees who have anything of interest they would like to place before him. The Bill as amended by Committee A has been published. It provides that, in estimating, for the purpose of any local rate, or of the basis or standard thereof, or of any valuation list levied or made on or after April 1, 1923, the value of any hereditament occupied for any trade, business, or manufacture, there shall be taken into account such machinery only as is fixed or attached to the hereditament, and cannot be removed from its place without necessitating the removal of any part of the hereditament. This section is not to apply in the case of any machinery or plant used in or on a hereditament for producing or transmitting first motive power, or for heating or lighting the hereditament. Where the effect of the Act is to alter the value of any hereditament in the area to which the Valuation (Metropolis) Act, 1869, applies, it is to have effect as regards any provisional, supplemental, or new valuation list made in the year commencing April 6, 1923, or in any subsequent year. Regarding the last-named provision, it should be explained that, as the law stands, changes of value which are not accompanied by alterations on the premises would not have effect until after the next quinquennial valuations which should be made in 1925, and would come into force in 1926. The Bill adjusts this.

Safeguarding of Industries Bill.

The House of Lords appears about equally divided on the question as to whether or not the Safeguarding of Industries Bill is of any real use to the country. Last Tuesday a motion by Earl Beauchamp that the Bill interferes with trade and increases prices, and expressing the opinion of the House that it should be repealed forthwith, was defeated by 36 votes to 34—a majority of only two.

Engineering Lock-Out.

Last week was the ninth in which the members of the Amalgamated Engineering Union have been locked-out, and the third for the members of the 47 other Unions. The "A.E.U." find funds running low; and the members who are out are not altogether enjoying themselves or the outlook. They must be dipping fairly deeply into their private savings—those who have any; and those who have are the thrifty ones, who do not like to see their money taking flight over such a matter as that which has deprived them of work. Negotiations have been resumed; and at the end of the week a provisional agreement was reached between the Engineering Employers' Federation and the Negotiating Committee of the forty-seven Unions other than the "A.E.U.," who have declined to renew negotiations on the employers' new memorandum. The Negotiating Committee of the other Unions refused to break-off negotiations, in view of the employers having made considerable concessions in respect of matters of detail. Before a ballot is taken, the Negotiating Committee decided to submit the new conditions to a delegate conference yesterday. The continued hostility of the "A.E.U." is an ugly feature in the situation; but the employers are not disposed to be forced by that Union into a position which they know full well would be untenable.

Heavy Motor Traffic.

Gas undertakings are interested in the modern use of roads from three points of view: First, because it has created an extensive use for their tar, which did not exist before; secondly, because gas undertakings themselves require the cheapest form of transport; and, thirdly, because underneath the road surfaces they have property the integrity of which it is important shall be preserved. A great deal of attention is now being paid to the question of road use and maintenance. In the House of Lords last week, the subject of heavy motor traffic was discussed, and the resulting serious cost thrown upon the ratepayers was put forward as a reason for an inquiry by a Committee of Parliament. The feeling was so decidedly in favour of this course being taken that, on behalf of the Government, a motion (proposed by Lord Harris) to that effect was accepted. What the cost of road upkeep is to the ratepayers was brought out during the week at the conference of the Institute of Transport. In a paper by Mr. Dixon H. Davies, it was stated that the expenditure on the roads that had to be borne by the rates was £40,000,000 a year for the United Kingdom. But Sir Henry Maybury, the President, tells us that the expenditure named represents high-water mark. The improvement that is being made in the condition of the roads is lessening the cost of maintenance. He calculates that the expenditure during this year will not exceed £37,000,000. Sir Henry has not the slightest anxiety as to the future; being confident that the ratepayers have in this respect seen the worst of a very bad time. Another matter bearing upon road traffic is the powers that the London and North-Western and Midland railway group are seeking from Parliament to run motor vehicles for the carriage of goods. There is opposition to this by private transport interests; and there is support by some manufacturers, but not by all. What the manufacturers want is fair competition, with the view to breaking-down the charges for transport. But there is not unanimity as to whether competition of this nature will permanently assure lower rates, or whether the railway companies will run the private transport companies off the road, and then have a monopoly.

Trade Unions and Political Action.

The second reading of the Trade Union Act (1913) Amendment Bill has been carried in the House of Commons. We are glad of this, and hope that the measure will find its way to the Statute Book. We believe in trade unions, but only when they adhere to their legitimate purposes, and do not make excursions beyond their proper limits into matters that are purely political. We have had enough of this sort of thing of late years. Over matters that were political and not legitimate ones for decision by the trade unions, but by the nation at large or their elected representatives, we have had some of the greatest industrial upheavals in recent years. The miners' strike was wholly and solely on political issues. If the basis of disputes in which trade unions engage is to be widened and deepened, trouble will become perennial. A host of trade unionists are opposed to their organizations travelling beyond their correct boundaries, and frittering away funds (this has been a rather prevalent abuse of late years) on questions that should be dealt with by the body politic. They do not want to contribute money for such purposes; and they desire that the action of trade unions in this matter shall be properly regulated. This is what the present Amendment Act has been designed to do. There is no attempt to destroy trade unions, nor to prevent their taking political action under certain defined conditions. The Bill lays it down that trade unions may raise and apply money for political objects, provided that a resolution of approval is passed by a ballot of the members in which at least 50 p.ct. vote, and that, of the votes recorded, those in favour of the proposal exceed by 20 p.ct. or more those who vote against it. In pursuance of such resolution, too, all moneys so raised (it is provided) shall be credited to a separate fund. The Bill has been strongly opposed—naturally by one side of trade unionism, and, likewise naturally, strongly supported by men who believe in trade unions sticking to their legitimate functions.

Silvertown Explosion and the East Greenwich Holder.

Gas engineers will be extremely interested in the remarkably striking photograph which we give in later columns of the damage occasioned in 1917 to the 12 million cubic feet gasholder at East Greenwich. The information as to damage and restoration, together with the photograph, we are able to give through the kindness of the Contractors (Messrs. Clayton, Son, & Co., Ltd.), and the courtesy of the South Metropolitan Gas Company.

PERSONAL.

Alderman J. W. Newbold, J.P., and Mrs. Newbold, of Borrowash, near Derby, have just celebrated their golden wedding. Alderman Newbold, who is 77 years of age, was Chairman of the Derby Gas Company, which position, for reasons of health, he resigned this year, though still retaining a seat on the Board.

Mr. Harold A. Beeching, of Lloyds Bank, has now been elected Chairman of the Tunbridge Wells Gas Company, in succession to the late Mr. W. H. Delves. Mr. Beeching, who has been a Director since 1898, has always taken a keen interest in the affairs of the Company. Though the Company was established nearly eighty years ago, only three gentlemen have hitherto occupied the position of Chairman—the first, Mr. Joseph Delves for eight years, the second, Mr. E. M. Hunter, for 36 years, and Mr. W. H. Delves for 35 years.

The Directors of the Brentford Gas Company have appointed Mr. A. A. Johnston (the Engineer and Manager to the Company) Engineer and General Manager, and have filled the vacancy occasioned by the death of their late Secretary, Mr. John T. Croxford, by the appointment of Mr. H. L. Mann, the Accountant to the Company, as Secretary and Acting Accountant.

Mr. Thomas Glover (of Hampstead), we regret to announce, has recently had to undergo two further operations, the last taking place on Monday, the 22nd inst. On going to press, we are informed that he is as well as can be expected; and Mrs. Glover desires on his behalf to thank all who have made kind inquiries.

OBITUARY.

GEORGE ROBERTSON HISLOP.

It is with a feeling of sorrow that we announce the loss to the gas profession of a very old and greatly esteemed member, Mr. George R. Hislop, of Paisley, who, following upon an operation, died in his 87th year in a Glasgow nursing home last Thursday night, the 18th inst. He will be greatly missed in the industry throughout the kingdom, as well as by a wide circle of private friends, and by the Government, as a Valuator; and deep sympathy is felt with the relatives.

Mr. Hislop started work when he was thirteen years old, and in early days held joint managership with his brother of the gas-works at Lanark. Later he obtained an appointment with the old Glasgow Gas Light Company, and then in 1857 went to Falkirk as Engineer and Manager. Four years later he took up a similar position at Coatbridge, where he largely extended the works, and laid mains to supply the outlying districts. Then on May 30, 1865, he was appointed Engineer and Manager of the Paisley Corporation Gas-Works, with which the main part of his life's work was destined to be bound-up. Here he had a wonderful record.

In June, 1914, Mr. Hislop entered on his jubilee year of service with the Paisley gas undertaking; and in connection with this interesting event, it was stated that during the 48½ years ended on the previous December 24, he had never missed a single Committee or other Council meeting relating to his department, and he was never late. On the date named, he was injured in a motor-car accident, from the effects of which he was some time in entirely recovering. In 1915, the completion of his fifty years' of work at Paisley was fittingly commemorated by the Town Council; Provost Robertson announcing that it had been unanimously agreed to present him with a token of appreciation of his services, and also of respect for him as a man. "Not only," he added, "had Mr. Hislop served Paisley during all this time, but he had been rendering great service to his country as well. Being an enthusiast in the work, he was not content with gas making as he found it, but believed many improvements could be made in the manufacture. He applied his mind to the subject, and by research and study introduced many appliances and processes which had gone a very long way to cheapen production." The gift, on behalf of the Town Council and of the citizens whom they represented, consisted of a handsome silver tray, "in token of high esteem and appreciation of long and faithful service." Another gift, from the staff of the Gas Department, comprised a massive silver calyx-shaped cup, which was handed over to him by Mr. A. S. Nisbet, the Assistant Gas Manager.

Mr. Hislop himself commemorated his jubilee at Paisley by the preparation of a historical record of the undertaking. It was pointed out in this that the original Gas Company was formed in 1823; gas being supplied for the first time early the following year. A period of 22 years elapsed before the transfer of the concern to the Board of Gas Light Commissioners; and when this event took place, the first manager was still in office. As a matter of fact, there had been only three managers when, in the spring of 1865, he was appointed to succeed Mr. William Foulis, father of the late Mr. William Foulis, of Glasgow. Various important stages in the history of the undertaking are chronicled in this record, not by any means the least important of which was that reached in 1885, when Mr. Hislop's patent regenerative system of heating the retorts having been installed, the fuel account was reduced by 40 p.ct., with the result that the price of gas was lowered from 3s. 9d. to 3s. 4d. per 1000 c.ft.; the surplus profits being 1s. 1·36d. per 1000 c.ft. Subsequently the price was brought down to 2s. 10d. per 1000 c.ft.

With 53 years' good service at Paisley to his credit, Mr. Hislop, in May, 1918, tendered his resignation of the position of Engineer and Manager. Referring to this announcement upon its appearance in the minutes of the Gas Committee, Provost Robertson again acknowledged that the town had benefited by Mr. Hislop's great skill as an engineer and as a manufacturer of gas. As Convener of the Gas Committee, Bailie Henderson pointed out that for a long period their Engineer had been deservedly regarded over the length and breadth of Scotland as an authority on everything connected with the manufacture and distribution of gas. Many gas-works profited by the adoption of his patents.

Mr. Hislop was to the end a member of the Institution of Gas Engineers, and those who were present will remember that as recently as the meeting in June, 1920, he seconded, in a bright little speech, the vote of thanks to Sir Dugald Clerk for his Presidential Address. He several times occupied the President's chair of the North British Association of Gas Managers, his first election dating as far back as 1869. He was also a Fellow of the Chemical Society, and a member of the Society of Chemical Industry and of the Royal Scottish Society of Arts.

The sudden death is announced, as having occurred on the 21st inst., of Mr. Robert Ernest Graves, C.B.E., H.M. Chief Inspector of Factories.

We are sorry to learn of the death of Mrs. Prince, wife of Mr. William Prince, Engineer and Manager of the Tipton Gas-Works, which took place at her residence, Ivy House, Park Lane, Dudley Port, on the 16th inst. Mrs. Prince had been an invalid for the past seven-and-a-half years; but she will be remembered by many as a one-time regular attendant at the annual Institution meetings. She leaves one son, who is Assistant Manager to Mr. Walter Whatmough, at Heywood.

Quick Coking Time with Koppers Ovens.

There has been put into operation by the Koppers Company at the plant of the Chicago Bye-Product Company a battery of Koppers bye-product coke-ovens of a new design which has been developed by Mr. Joseph Becker, the firm's Consulting Engineer. These ovens have been operating for several months now; and the results are stated to have been remarkable. In addition to a great reduction in the average coking time, the coke is of the highest quality; and blast-furnace experts who have examined it have stated that in their judgment the coke produced in these ovens will make possible greatly improved blast-furnace practice and a lower consumption of coke per ton of iron produced. The advantage of the new oven to the gas industry, besides the high quality of the coke produced and the increased revenue possible from this source, will, it is pointed out, be in the increased gas capacity possible. While formerly it took anywhere from fifteen to eighteen hours to carbonize a charge of coal, with this oven it is possible to do it in from ten to eleven hours. In other words, from 40 to 45 ovens of this type will produce the same amount of gas per day as 60 of the older type, making possible a much lower investment cost. Although the new ovens built at Chicago are of 12-ton capacity, the design has been adapted by the Koppers Company to the small-type oven of from 5 to 6 tons capacity.

North of England Gas Managers' Association.—The sixth half-yearly auxiliary meeting of the Association will be held at the Tynemouth Gas-Works, Minton Lane, North Shields, at 1.30 next Saturday, May 27. The chair will be taken by Mr. W. E. Oulds, of Tynemouth, who will give an address. There will also be an inspection of the works, after which tea will be served.

Royal Sanitary Institute Congress.—Extensive arrangements have been made in connection with the 33rd congress and health exhibition of the Institute, to be held in Bournemouth from July 24 to 29. A large and distinguished attendance is anticipated; and the preliminary programme shows that the discussions and excursions will be of so varied a character as to offer something of interest to everyone. Among the subjects are "Modern Practice in the Manufacture, Distribution, and Utilization of Gaseous Fuel, with special reference to the Public Health and the Gas Regulation Act, 1920," "Domestic Heating and Ventilation," "Housing Schemes in Glasgow, with special reference to Smoke Abatement," and "Smoke Abatement." The visits include one to the Poole Gas-Works, where there will be a reception and tea by the Bournemouth Gas and Water Company.

ELECTRICITY SUPPLY MEMORANDA.

THERE are people in the electricity supply industry who are fond of deceiving themselves. Perhaps they derive pleasure from the little (to other persons) harmless exercise. If so, far be it from us to suggest they should be denied it.

Electrical Self-Deception.

"Meteor," in the "Electrical Times," mentioning that electricity is dearer than it was before the war, says, with a sort of jerk: "Yes, but what of gas? Considering its quality then and now, has it not risen in price much more steeply than electricity?" That depends on how the price is calculated. It may not have risen more "steeply" than electricity per therm. "In several of the smaller towns," remarks "Meteor," gas was selling at 6s. to 7s. per 1000 c.ft. in 1919, and many rises have taken place since. So have many reductions in the price. But surely "Meteor" knows that the small places where such prices are charged are responsible for but a fraction of the total quantity of gas supplied in this country. He refers to Bexhill, where, he says, gas was 4s. in 1911, and is now 7s. 5d.; and he reckons it is about to climb to 9s. 2d.! He thinks that electricity at 3d. or 4d. per unit for cooking should knock its rival into a cocked hat. "Meteor" should not be quite so cocksure about this, nor give way to such a flight of imagination as there is in the succeeding words: "Of course, although electric cooking is so much cheaper than gas cooking, &c." Who said so? Who has demonstrated it, taking the whole range of cooking into consideration—oven, hot-plate work, water-heating, and all? However, maintaining his confident vein to the end, our friend asserts that "the main thing is that nobody interested in electrical cooking apparatus need be alarmed in the least by a price (say) of 3½d. for electricity. The first question, he says, is: 'What is the local price of gas?'" This is worth examination. Take one of the country towns with gas temporarily at 7s. 6d. per 1000 c.ft. There 3½d. would buy about 40 c.ft., or (say) 20,000 B.Th.U. The 3½d. per unit of electricity provides a potential thermal value of 3420 B.Th.U. Take the overall efficiency of the modern gas-cooker, including the hot-plate at 50 p.ct., here we have 10,000 B.Th.U. usefully employed. From the electric-oven there are heat losses; the elements on the hot-plate may have an initial efficiency of 45 p.ct., but this is a proved declining quantity with use. However, "Meteor," fallible like the rest of us, asserts that nobody need be alarmed in the least by a price (say) of 3½d. for electricity! Self-deception is a cultivated failing with some people, and it grows with them to gigantic dimensions.

Help of Contractors and Ironmongers.

The electricity suppliers are patting the contractors and the ironmongers heartily on the backs. They are all jolly good fellows. They were not always so regarded. Why are they now? The electricity undertakings want their assistance to a larger extent than heretofore. They are people with influence and shops; and the electricity managers desire to secure advantage from both. They want the contractors to turn their interest as much in the direction of appliances as in that of wiring. They think they should have showrooms, and go strongly into the business of domestic electrification. They also urge the ironmongers to carry good stocks of electrical goods, and prominently to display them. So they are trying to cultivate a better friendship—sensibly, believing that the greater the distribution of influence, of display, and of activity, the better for the electricity supply business. That is our view. Some of the contractors and the ironmongers do not appear to reciprocate these attentions with any great enthusiasm. They know there is something in it. What there is in it is that these electric appliances cost a considerable amount of money; and the selling of them is not so easy to effect as of Good Friday buns. The people who can purchase such goods are not the multitude; and those who can afford to buy them appear to do so more on account of having something novel than in view of any proved utility. There are domestic appliances electrically worked that are good; but they are not electric cookers and heaters—regarded from the important angle of economy. There are some people who assert the contrary; but the majority of these are the vendors, and not the users.

Raiders and Contractors' Lethargy.

If saying good things about them will not rouse the contractors and ironmongers, then perhaps it is well to see what a little warning will do as to possible loss of business. Something of this kind has been going on in the correspondence columns of the electrical papers. The contractors have been told that the official organ of the retailers of sewing-machines, washing-machines, and carpet-sweepers is continually advising its readers to meet the demand, and not leave it to the electrical trade. In view of this, the works manager of one electrical appliance company considers the electrical trade stands a good chance of losing what might be a lucrative part of its business unless it bestirs itself. The warning has been followed by echoes in the electrical press. There is fear on the part of one writer that many electrical contractors and supply dealers are not yet sufficiently alive to the need for meeting the increasing demands for domestic electric appliances. Another correspondent says that the electricity industry is unique, in that it is probably the only industry that has not an effective or really efficient retail sales organization. The same would-be energizer states that the electrical manufacturer has produced the goods, and could produce them still cheaper if only the bulk of the supply authorities and contractors would more energetically do their part of the process first by stocking, and secondly pushing the sale of, such devices. This writer says things in a way that should act as a spur. Here is an example: "An ironmonger sells lamps largely because his shop is in the main street; the contractor's is usually in a side street, with a window that looks like a cross between a second-hand dealer's and a scrap merchant's." Still another correspondent has "precious little belief that the electrical contractors will do anything worth talking about. They are the worst shopkeepers in the world." His view is that if the contractor of to-morrow is not a bit more lively than the contractor of yesterday, he deserves to lose this business.

The Electrical Shop.

"Electrical Industries" has a special article with this heading, and this is further evidence of the current interest that is being taken in pushing the sales side of the electricity business. The article corroborates observation that the electrical shop is a rare thing, though there have been many approximations to it. Manufacturers have opened showrooms, at which the public might select fittings to be purchased through the contractors. Supply authorities have also opened showrooms, in which a small amount of direct buying is done. Large department stores have here and there opened showrooms in which there is a certain measure of direct buying. The majority of electrical contractors own premises which they describe as a shop; but our contemporary says, as a rule, these do not represent the true electrical shop. While the industry has looked to the contractor for the greatest enterprise in this matter of electrical shops, on the whole he has declined to take the electrical shop seriously. Wiring contracts, with a fat little order for fittings, is what the contractor is after; and while it is convenient to have a shop where lamps and accessories may be sold, any kind of place will, in his view, do well enough. It is clear from this that our contemporary does not place any high value on the average contractor's shop; and it says some cutting things—for example, about the "exasperating lack of everything commercial." But there are shafts of sunshine coming through the clouds of unconcern and neglect. "Melancholy displays of dusty fuse boards, ceiling roses, and switches, variegated with out-of-date and fly-blown showcards, are not so common as they used to be. Nowadays we find quite a fair proportion of contractors' windows which contain samples of things that really interest the user of electricity." While in a measure this is so, however, it is clear that our contemporary is far from satisfied; but to some extent it excuses the contractors, who have a fairly definite answer to the charge of being half-hearted in this matter of electrical shops. Discounts are not large enough to warrant the expenditure by them in creating a tendency to buy, seeing that the manufacturers would be the real beneficiaries. The manufacturers, on their part, say they cannot afford to give larger discounts, because the retailers do so little to sell the goods. If it is not worth the while of the retailers, they are not to blame. But mutual interest ought surely to be of sufficient strength to bring about an understanding that would remove the obstruction. Perhaps, then, this would mean to the public still more substantial prices, which are already a sufficient bar to restricted custom—due possibly to the high costs of production. Electrical appliances are not by any means cheap things to make.

Model Houses.

Great enterprise has always been shown by the Newcastle-on-Tyne Electric Supply Company. They have given another instance of this in dealing with a new building estate at Gosforth, where the houses are of the villa class, and not of the working-class type. There they have equipped one of the villas as an "all-electric" house, to serve as a "model" of how they consider all such houses should be equipped. Some gas companies have shown similar enterprise. We remember years ago the South Metropolitan Gas Company set the fashion in the south-east of London when a new estate was being developed there. That was not the only instance. The same Company carried the work into other parts of their district. The photographs that have been published of the Gosforth electric house show a kitchen well equipped with apparatus, including a Jackson cooker, a Weston-Norrie water-heater attached to a circulating cylinder, and a Western electric dish-washer. There is also a Belling boiling-ring, a Revo iron, and a Jackson kettle. Inside the porch is an "Electrolux" floor polisher. The statement before us does not disclose what is in the other rooms in the way of electrical apparatus. But we should like to see an estimate of the cost of fitting-up these houses with all the appliances contained in this "model." We fancy the incoming tenants will look a bit astonished when the total figure is mentioned.

Safety of Electric Lighting!

The charity hospital of Santo Spirito in Rome, where 800 patients were sheltered, has experienced a disastrous fire, in which sixteen persons perished. The reports from Rome are unanimous in saying that it is believed the fire originated in a short-circuit. In the "Daily Telegraph" there is the independent message of Mr. A. Beaumont, who states that

the fire originated in the laundry room. He further says that the electric wires had to be severed, and the current stopped, so that the entire hospital was in darkness, except the rooms nearest the fire. In another report in our morning contemporary, it is remarked that "the conflagration is supposed to have been caused by a short-circuit or by negligence in a room annexed to the laundry, where a quantity of wood was stored." The whole of the laundry was already in a blaze before the alarm was given. "The attendants at first imagined that there was little danger, especially as a short-circuit two years ago in another part of the building caused a fire which was rapidly extinguished. But a panic followed soon after the first alarm when the electric light went out, which, contrary to first reports, did not follow, but *preceded* the falling-in of the floor in the room occupied by chronic patients." The newspaper reports come from Rome and Milan. The editors of our electrical contemporaries will sit in their arm-chairs in London, and write contemptuously of the reports and their authors.

Street Lighting. A series of articles on street lighting has appeared in the "General Electric Review;" and the "Electrician" has published a summary. From this it appears that the luminous or magnetite arc lamp is much used in the larger cities of America for ordinary street illumination. A great deal is heard about "white-way" illumination. This involves clusters of high-power incandescent or luminous arc lamps. For this lighting, standards are used 18 ft. or more in height, carrying two, three, or more high-power luminous arc or incandescent fixtures. The cost of installation is stated to be $4 to $8 per foot frontage; and for such lighting gasfilled lamps of 1000 to 2500 c.p. are commonly used. Turning to the different classes of street lighting, there are three: (1) Those in which to the ordinary requirements of safety and convenience something is added with a view to display; (2) normal street lighting suitable for thoroughfares carrying important traffic; and (3) lighting for residential and other streets where traffic is small and the requirements of the police are not severe. In practice, it is held, the most important public streets should receive an average of 0·25 foot-candle. The great bulk of street lighting, however, demands less exacting conditions, and a general order of illumination comparable with full moonlight, and ranging (say) from 1·20 down to 1·50 foot-candle should answer. Here the larger incandescent lamps of 100 to 500 watts are considered to suffice. As to contract illumination tests, in view of the low illumination practicable in most street lighting, they require special care. A sufficient number of lamps must be tested, and due consideration must be given to the effect of reflection from buildings, shadows cast by trees, and other extraneous factors. Important decisions should be based on laboratory tests, where exact conditions can be noted. The most logical method, in rating lamps for street lighting, is to specify the mean spherical candle power, and to describe the lamp by type. Allowance for depreciation of incandescent lamps during life must also be considered. The choice of the type of glass for diffusing globes now becoming commonly used for street lighting presents interesting problems. The aim of modern design is to secure complete diffusion of light without undue loss of light, and without the globe becoming too heavy. Diagrams show that increasing weight is accompanied by progressive increase in absorption of light; but a transmission of 87 p.ct. is claimed for some of the latest "alabaster" and "carrara" glassware. Generally speaking the transmission varies from 60 to 80 p.ct. according to type.

Salt Lake City and Smokeless Fuel.

In a survey of the Salt Lake City smoke problem, engineers of the United States Bureau of Mines ascertained that about 27 p.ct. of the smoke emitted in the city was from residences. This suggesting the need for smokeless fuel, the Bureau proceeded to conduct an investigation regarding the feasibility of establishing a local supply of coke to satisfy domestic heating requirements. The Bureau found that the installation of a bye-product plant of sufficient size to supply the entire domestic demand of Salt Lake City for coke fuel, is not economically feasible unless municipal legislation prohibiting the production of smoke is obtained. By education and legislation, consumers must be induced to pay $3 more per ton for smokeless fuel than for the ordinary bituminous coal, in order to make the carbonization plant a success. While the coke and bye-products of a low-temperature carbonization plant would probably find a readier market than those of a standard high-temperature apparatus, neither would be a commercial success without protective legislation. Future developments in the iron industry of the State, and in the substitution of bye-product ovens for the beehive ovens at Sunnyside, Utah, will, when conditions warrant the change, make available a supply of the smaller sizes of coke for domestic use; but it is doubtful whether the entire domestic requirements can be satisfied in this manner at a sufficiently low price. Thus no single solution for the problem of domestic smoke appears to be available. It is suggested that the means which should be considered for alleviating the nuisance are the sale of the available supply of gas-works coke, briquetting of coke breeze from the Sunnyside beehive ovens, burning of powdered coal where feasible, the installation of a semi-experimental 100-ton plant for low-temperature carbonization, and the continuation of an educational campaign to teach domestic consumers proper methods of firing.

TOWN GAS MANUFACTURE.*

Captain Staley's little book is primarily intended for the inculcation on an intelligent mind of a rudimentary knowledge of the process of gas-making for town supply. It carries out its object with great credit to its author. It is more than a five-finger exercise, being rather of the nature of a prelude to the more ambitious works wherein one finds all the numbers elaborated. The composition is excellent. It can be felt that, had Captain Staley been allowed more sheets, he would have reduced the elaborate work of other composers to simple themes easily picked-up by any good lay-minstrel. No secret is made of the fact that the book is written principally for the embryo gas engineer; and it is abundantly clear that any student who absorbs the broad insight given regarding the principal operations at any good gas-works need never feel ashamed of his acquaintance with this work, if he absorbs the sound practical information it contains.

Pitmans' technical primers are well known; and this latest addition fills a gap in the list, the existence of which for so long is somewhat surprising. It also makes a fitting companion to the other primers on ancillary subjects published by that firm, all of which are written by men who are masters of their subjects. The embryo gas engineer can therefore extend his knowledge to those subjects which are necessary for him, so that he may lay down solid foundations for his future career. Of course, in a work of this description no good is achieved by confusing a student's mind with the doubts and difficulties found in experience. Captain Staley avoids this, but nevertheless gives indications in the text of what is in his own mind.

There seems to be a vein of humour to old practitioners, when we read on the first page: "Coal gas is obtained . . . from the destructive distillation of more or less suitable coal in enclosed sealed vessels called retorts." Some of us during the war and since have met the "more or less" brand of coals. There are pits which might, without transgressing verity, rename their brands by using this elastic description. Captain Staley must be referring to some of this brand when he says the solid residue after distillation is 85 to 90 p.ct. of pure carbon called coke; but it cannot be agreed that it is "pure" carbon, though heartily concurring when he adds "called coke." On p. 10 he gives the carbon content of an "average" composition of coal as 75 p.ct., which is a better ideal for the student to bear in mind than the former estimate. When the "more or less" brand does get emptied into gas-works, there is little doubt that the old and tried friend of gas-makers—the horizontal retort—can do more with it than any other method; and this seems to be rather in the author's mind in "Horizontal Settings" [p. 12], when he remarks: "Yet many engineers—after much experience of all types—still pin their faith to the horizontal retort." No doubt because he knows that gas oil is of a practically stable quality as compared with gas coal, Captain Staley definitely states, in the résumé of processes, that a "suitable" oil is used for water-gas making.

The student is told [p. 4] that a gas-works should be situated "at the lowest level of the district it is to serve, as the pressure of gas in mains decreases in falling mains and increases in rising mains"—a very good rule to establish in a student's mind, but not an invariable one, because with the higher pressures prevalent nowadays it need not be an axiom that the site should be at the "lowest" level, as the matter of pressures is easily overcome even if the works is situated at a higher level, where the cost of site and working expenses might in cases be less than in a factory crowded lower level. Water facilities would always be at the lowest level, but rail or road facilities might not be. In "Mechanical Handling" of coal [p. 6], useful illustrations and descriptions are given of various practical methods. In Scheme C one can certainly agree with the author that a bucket conveyor "requires very little power to drive it;" but those with long experience of this type would hardly agree to the deprecatory remarks "but it is costly per foot run, and requires expensive inlets and outlets; also, it is easily spoiled by neglect"—because they would agree that in the long run it is the most economical, and moreover can easily be made to pass under the coal-store, and thus perform the function of emptying the store as well as of filling it. This is an important matter, and might be included in any further edition without unduly overcrowding the covers.

In "Ammonia Extraction" [Chapter VIII., "Wet Purification"] the author gives much useful practical advice, and points out, as undoubtedly should be done, what is good, and also what is not good, filling for a tower-scrubber. It is necessary for the embryo gas engineer to be put on his guard. But one cannot agree that board filling is "undoubtedly" the best; rather it should be grids made of rough-sawn sticks about 1 in. square, nailed to form squares about 3½ in. in the clear, which are "undoubtedly" the best filling at present, because there is no blocking-up, no back pressure, more wetted surface, and more dripping action, with the result that the same scrubber will do considerably more work so filled, and gives no trouble.

The author makes but little reference to the "therm." No explanation is given of the nature of the now all-important term; and it is only by a process of deduction given in the concluding "notes" in Chapter II., "Coal," that the student can gather the

* "Town Gas Manufacture." By Ralph Staley, Engineer and Manager of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company. Sir Isaac Pitman and Sons, Ltd., Kingsway, London, W.C.; 1922. Price 2s. 6d. net.

value; for we are told a ton of "good" coal will yield about 13,000 c.ft. of gas having a heat value of 520 B.Th.U. per cubic foot, or about 67 therms. "Good" coal, indeed, but seldom met with these days. The "more or less" brands are not usually so kind; but let us hope that by the date the student takes up his practical duties, time and good sense may have effected such a desirable change in the much-needed cleansing of coal at the pits, and save the uneconomical usage of plant, labour, &c., on the alien matter now too often found accompanying "coal."

Bearing in mind these few criticisms compared with the bulk of the unchallenged matter of "Town Gas Manufacture," one can only say that the student who intelligently absorbs the information given need never feel "small" if he has a "crack" with a practical gas man, and may rest quite assured that, if he intends making the subject his profession, he has obtained an excellent beginning, for it is written by a practical man.

H. O. CARR.

PROGRESS OF APPLIED CHEMISTRY.

IN drawing attention to the sixth volume of these reports*, it is unnecessary to dwell at length upon the aims of its compilers. Its twenty-six sections are contributed by specialists seeking to record the progress and tendencies not only of purely chemical industries, but also of the applications of chemistry in general. Thus it becomes practically a record of technical industrial progress in 1921.

The report, with its section of "Gas, Distribution, Distillation—Tar Products," by Dr. G. Weyman, of the Newcastle Gas Company, is a reminder that the gas industry itself is a chemical industry. And did not Sir Arthur Duckham recently describe gas engineering as "the only real chemical engineering profession in the country?" Some, in their zeal for the primary business of the industry to purvey fuel, esteem lightly bye-products and chemical aspects. This view may be debated. The production of bye-products is creative of national wealth—a source of strength to the industry which thereby thrusts its roots deep into the industrial life of the country. That this root system is capable of further growth is evident from a perusal of the report. Think of the sulphur and nitrogen compounds which carbonization might yield from coal, and the fate of the cyanides.

While distribution authorities are unanimous in advocating the complete removal of cyanogen compounds from gas, those responsible for production are less enthusiastic. The direct financial return is not sufficiently attractive, essentially because there is no adequate outlet for the great quantities of cyanogen compounds which might be produced by the British gas industry. As it is, the gas-works residuals have to compete with synthetic processes on no advantageous terms. Some new and large outlet for sulphocyanides and ferrocyanides is required to make prospects more favourable. In J. Huebner's section of the report on "Textile Fibres, Cellulose, Paper, &c.," reference is made to new possibilities of this kind which appear to have received inadequate attention in the gas industry. On p. 127 he says: "One of the most important researches carried out during the year on the subject of cellulose solubility is that of H. E. Williams (J., 1921, 221 T.), who, in examining the solvent action of the metallic thiocyanates on cellulose, finds that the process is governed entirely by the physical condition of the salt, which must be a liquid hydrate—an associated molecular complex of salt and water, having a suitable boiling point, a viscosity above a defined minimum, and a positive heat of dilution between certain fixed limits. He deals with a large number of experiments on the action of the various thiocyanates on cellulose. Mercerizing and parchmentizing effects may be obtained by the treatment of cellulosic material with thiocyanate solutions under suitable conditions, and the process is likely to be of considerable industrial interest. The theoretical considerations on which he explains many of the results obtained will be published shortly." The textile and paper trades are among our large industries, and might be important potential consumers of thiocyanates—a matter of great interest to the gas industry.

Another important section—"Acids, Alkalis, and Salts, &c." by Mr. P. Parrish, of the South Metropolitan Gas Company, brings into review the progress in the heavy chemical trades. The achievements of synthetic chemistry in this field have been great, and closely affect the economies of carbonization industries; and in this section the reader can find a comprehensive survey of these developments.

"Fuel" in general is dealt with this year by Prof. J. S. S. Brame, and "Mineral Oils" by Mr. J. E. Hackford. By means of these sections the developments in fuel in science and practice in all its bearings are brought into review. Prof. W. E. S. Turner, of Sheffield, contributes a section on "Refractory Materials"—a subject of increasing importance to the industry.

This brief survey by no means exhausts the possibilities; but it will suffice to indicate the scope of the reports, which are indispensable to those who seek a record of the progress of chemical technology in its broadest sense.

H. J. HODSMAN.

* "Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry," 1921, Vol. VI. Price 7s. 6d. to members of the Society, and 12s. 6d. to non-members—post free.

THE INFLUENCE OF STRUCTURE ON THE COMBUSTIBILITY AND OTHER PROPERTIES OF SOLID FUEL.

A paper on the above subject, by Messrs. E. R. SUTCLIFFE and EDGAR C. EVANS, was read by Mr. Evans at a recent meeting of the London Section of the Society of Chemical Industry. Mr. Sutcliffe is the head of the engineering firm of Sutcliffe, Speakman, & Co., of Leigh, Lancs.; while Mr. Evans was formerly head of the Rhondda Research Laboratories, and was Chief Scientific Advisor to the late Lord Rhondda.

The paper, which summarized the results of ten years' continuous research work on the part of the authors, and opened up extremely important possibilities in connection with the future of British industry, dealt, in the first place, with the work which has been carried out by various investigators on the subject of structure in relation to combustibility of fuels; but it was pointed out that nobody had gone into the subject in very great detail. The combustibility of coal was not altogether a question of heat value, but one in which the structure of the residue after the gases had been driven-out played an important part. Homogeneity of fuel was an important factor, and a far greater consumption of fuel per square foot of grate area was obtained by ensuring as far as possible uniformity of size of the particles—except, of course, in the case of caking coals. Also, generally speaking, the smaller the particles the greater the combustibility of a fuel.

Mr. Evans described briefly some tests which were carried out with ordinary coal, pitch-made briquettes, and pure coal briquettes made without a binder, the full details of which will be published later in the Journal of the Society. The transmission of heat per square foot of grate area per hour was 4070 B.Th.U. in the case of the raw coal, 4039 in the case of the pitch-made briquettes, and 4650 in the case of the pure coal briquettes. The weight of fuel burned per square foot of grate area per hour was also much greater in the case of the pure coal briquettes. The tests, said Mr. Evans, were not strictly comparative, and the authors had reason to believe that 50 p.ct. more of the pure coal briquettes could have been burned per hour than of the raw coal or pitch-made briquettes.

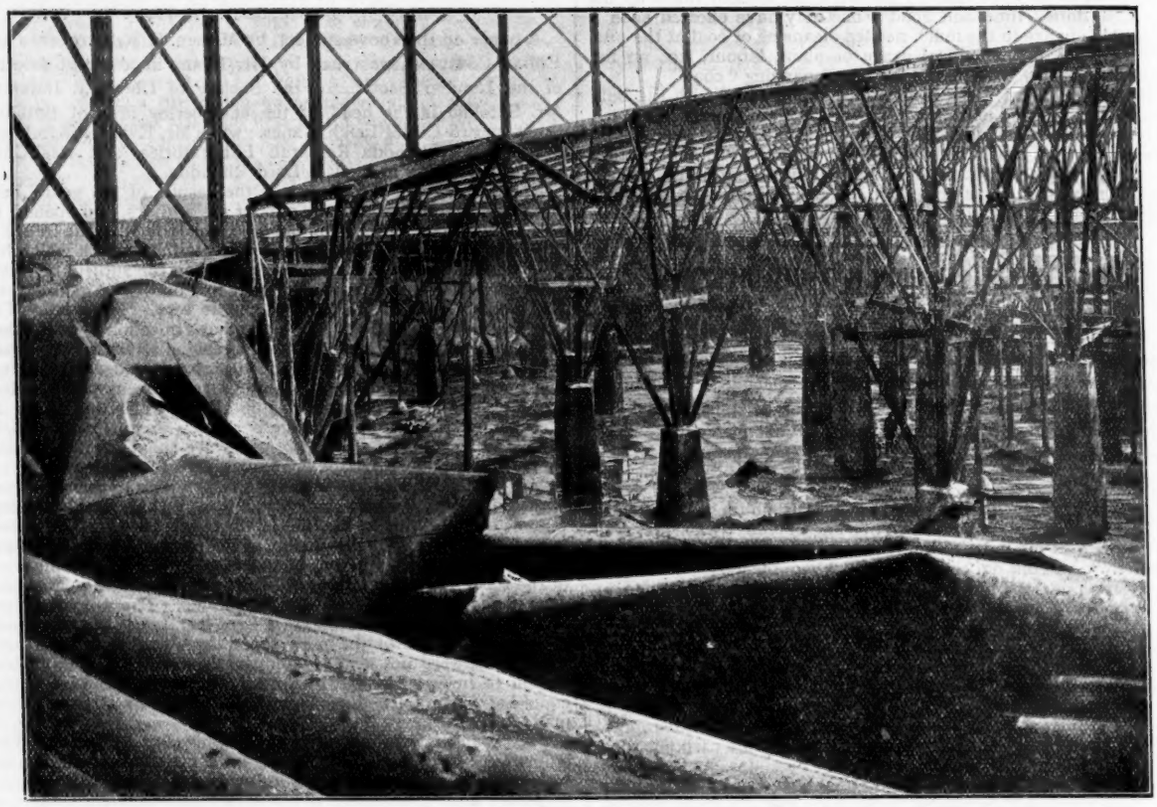
Factors in the combustibility of carbonized fuels were: (1) The influence of volatile matter; (2) the influence of graphitic film on high-temperature coke; (3) the influence of areas of surface; (4) porosity; and (5) character of cell structure. Gas coke was not an ideal product; and its incombustibility was due primarily to the fact that the volatile products during carbonization had to pass through the red-hot mass of coke in the process, and deposited a film of graphitic carbon, which was not combustible. The question of structure had a great deal to do with the incombustibility of coke, and not the volatile content. Probably the most important factor in the combustibility of a solid fuel was that of continuity of the cell structure; and there was also the question of the dimensions of the cells. The most desirable fuel was one as dense as possible, with minute cells, and a large number of those cells per unit of mass. It was the continuity of these cells that made charcoal so highly combustible.

The authors had experimented with a coke made after preliminary briquetting, and had come to the conclusion that such a fuel had great possibilities commercially. In a boiler this fuel greatly increased the radiation in the furnace; and it was believed that such a fuel would lead to simplification of boiler installations and to increased output of steam per boiler; so that it would not be necessary to have the elaborate economizing and superheating systems now used. Also, very considerable economies were still to be made in connection with blast-furnace practice. in spite of the investigations carried out during the last forty years. These economies would include a higher CO_2 ratio, reductions in heat losses and fuel consumption, and probably reductions in the dimensions of blast-furnaces, by reason of the higher efficiencies obtained through burning such coke as had been mentioned. Altogether, the question of structure was of vital importance to the iron and steel industry, and would probably play a very important part in the future of the industry.

The work performed would allow of the production of smokeless fuel of first-class quality for domestic consumption in any existing gas-works or coke-oven plant in the country. Such a fuel would be extremely dense and hard, and would completely solve the smoke problem in the great cities of this country. The paper was illustrated with photographs and lantern slides which had been specially prepared by Sir George Beilby, Chief of the Fuel Research Board.

Reference was made in the course of the discussion to the increased combustibility of the coke supplied by the South Metropolitan Gas Company, by mixing it with a more combustible material; and one gathered from Prof. H. E. Armstrong, who had used it on his own hearth, that he had found its combustibility had increased in a striking manner. Mr. E. V. Evans, of the South Metropolitan Company, who is Chairman of the London Section of the Society, said that the Company had investigated the degree of combustibility by examining microscopically the ash produced by the combustion of pulverized fuel, and had found that the amount of combustible matter left in the material did depend on the state of division to which the material had at first been ground.

THE WRECKING OF THE LARGE GASHOLDER AT EAST GREENWICH BY THE SILVERTOWN EXPLOSION IN 1917.



A STRIKING PHOTOGRAPH OF THE DAMAGE CAUSED, BY THE SILVERTOWN EXPLOSION IN 1917, TO THE EAST GREENWICH 12 MILLION CUBIC FEET HOLDER OF THE SOUTH METROPOLITAN GAS COMPANY.

The accompanying illustration presents a striking view of the large gasholder at East Greenwich, in its wrecked condition, as a result of the disastrous Silvertown explosion which occurred on Jan. 19, 1917.

This huge gasholder with a capacity of 12 million cubic feet was erected in 1892, to the designs of the late Sir George Livesey, and was, until the erection of the Astoria holders, the largest holder in the world, and was so known by engineers throughout the gas industry.

Silvertown is 2½ miles away from the site, across the Thames, and at the time of the explosion four lifts of the holder were inflated; but the effect was so violent as to rip open the crown right across, and through the gap about 8 million cubic feet escaped. On the gas being released, the four shells dropped suddenly, and the rapid descent and the bumping together ignited the escaping gas which harmlessly burnt out in a few seconds.

On the damaged crown reaching the internal framing, the top sheeting parted, and fell away to opposite sides of the tank, taking with it into the tank the top curb and a portion of the dips and sides of the second, third, and fourth lifts, as shown in the illustration.

The work of repairing and reconstruction was without delay given to the original builders of the holder—Messrs. Clayton, Son, & Co., Ltd.—who carried out their very difficult task to the satisfaction of the South Metropolitan Gas Company.

After emptying the tank, and before cutting away the wreckage, the top curb and part of the lifts had to be suspended from each of the 32 standards—a weight amounting to about 280 tons. The top curb had been broken in about eighteen places; and it was found highly dangerous to cut-away any portion until properly secured.

When the four lifts had been cut away, it was found that the fifth and sixth shells were also badly damaged; the vertical stays being bent and twisted, and the sheets in many places split from top to bottom. In order to repair these lifts, the outer shell, weighing 155 tons, had to be lifted clear of the tank.

The external framing was undamaged, but damage was done by the fallen crown to the timber internal supporting frame and the inlet and outlet pipes. These were repaired by the Gas Company.

The repairs were eventually completed, and the holder put to work again in 1919.

Notwithstanding the special work involved, and the huge mass of distorted steel handled, the reconstruction was carried out without serious accident.

Standard Gas Appliance Specifications.

Among the active Committees of the American Gas Association is one on Standard Gas Appliance Specifications, whose endeavour has been to formulate specifications and requirements for the manufacture of appliances that will ensure customers of the industry the best possible service; and in this work the makers have co-operated to the fullest extent. As long ago as 1911, the National Commercial Gas Association formed a Committee on Gas Range Specifications; and in the following year there was a report submitted to the convention. Ever since that time, the work has been carried on; being subsequently enlarged to cover all gas appliances, until in 1920 the American Gas Association published a full and comprehensive set of gas-range specifications, which were adopted by the Commercial Gas Association. Manufacturers and gas companies promised their co-operation; and there was concrete evidence of good faith. Some manufacturers began at once to stamp their ranges: "Constructed in strict compliance with specifications;" and some companies declared in black and white that: "In future no gas-ranges will be purchased that do not conform to these specifications." But unfortunately the matter did not end here. To quote the "American Gas Association Monthly": "All range manufacturers did not stamp their ranges; and, worse than that, some tried to reduce prices of their product by stripping a range, thus not only placing it without the pale of standard specifications, but destroying its proper operation. The blame? Possibly up to the manufacturer, possibly up to the gas companies' demand for lower-priced appliances. But this was not the worst. Manufacturers of ranges have been actually requested by gas companies to reduce the quality of a range in order to make a saving in price. A saving of possibly $1.50! It is unbelievable, but nevertheless a fact. To save a few cents on a range, the manufacturer has been asked to disregard standard specifications and impair the working qualities of the ranges. After many years of conscientious work, are we going to lose all the ground we have gained?"

Sir George Beilby is to read a paper on "The Structure of Coke: Its Origin and Development," at a meeting of the London Section of the Society of Chemical Industry, in the Institution of Mechanical Engineers, on Monday, May 29, at 8 p.m.

DEMPSTER-TOOGOOD VERTICAL RETORTS AT BATLEY.

Some Descriptive Notes.

The following notes on the installation at Batley of "Dempster-Toogood" (steamed) continuous vertical retorts are taken from a pamphlet prepared for the opening ceremony by Messrs. Robert Dempster and Sons, Ltd., of Elland.

The formal ceremony of inauguration of the new continuous vertical retort installation at the Batley Corporation Gas-Works took place on Tuesday of last week, in the presence of a gathering of many members of the Corporation and gas engineers from most parts of Yorkshire, many other districts of the North of England, and several undertakings of the Midlands and the South. The entire party were the guests for the day of Messrs. Robert Dempster and Sons, Ltd., of Elland, the suppliers and erectors of the new plant.

THE OPENING.

The visitors were received at the works by Mr. R. H. Duxbury, Engineer and General Manager to the Batley Gas Department (to whose specifications the work had been carried out by the Contractors), and by Mr. J. W. Broadhead, Managing-Director of Messrs. Robert Dempster and Sons. They were shown, in the new mess-rooms, models of the chief features of the Dempster-Toogood retort and other apparatus. Here also, Mr. H. J. Toogood built-up a sectional model retort-setting, explaining in detail all the advantages claimed for the Dempster-Toogood outfit.

The visitors were taken over the plant itself, which has been working with complete success since November last. It is not yet, of course, operating at the full 1,000,000 c.ft. per day capacity for which it is fitted. There is no need, or anywhere near it, for such an output. As a matter of fact, the plant was working at some 800,000 c.ft. during the winter; and its recent summer load has been about 350,000 c.ft. per day.

The MAYOR OF BATLEY (Alderman T. Western) presided over the formal opening ceremony, and complimented the Contractors on the manner in which they had carried out the work.

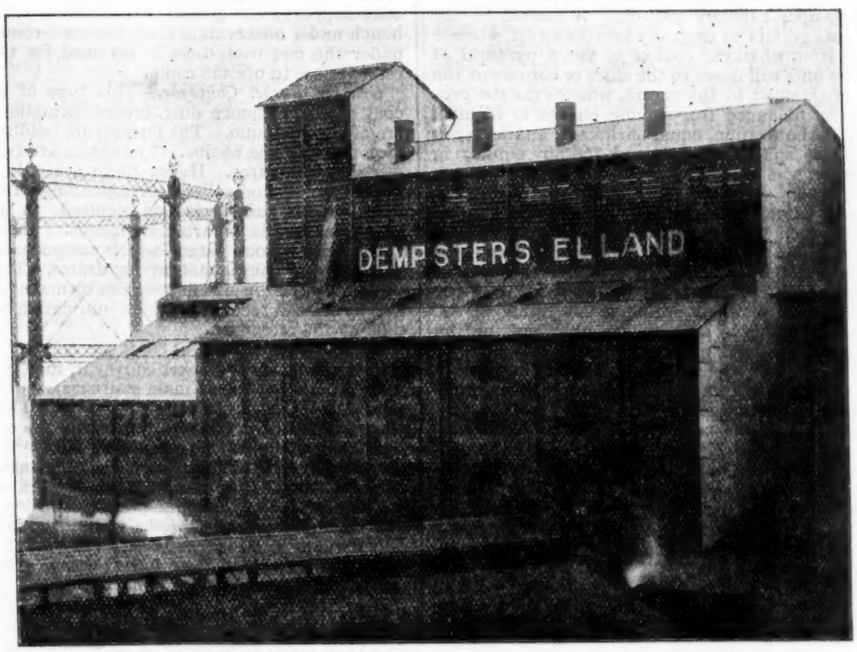
Mr. J. W. BROADHEAD briefly outlined the distinctive features of the Dempster-Toogood system; and, for the benefit of the non-technical visitors, epitomized the main differences between carbonization by vertical retorts and by the inclined retorts hitherto in use at Batley. (The old plant, now very much the worse for wear, and discontinued, was installed in 1897.) Mr. Broadhead said his firm were given the contract in 1920. The foundations for the bench were laid in January, 1921, and the plant was put into operation in November of that year. The firm rather prided themselves that they had done a fairly smart piece of work in completing the job in that time—especially considering that they had to deal, during the period, with a railway dispute and a miners' strike which partly paralyzed most of the industries concerned in producing the plant.

Alderman DAVID STUBLEY (the Chairman of the Batley Gas Committee), in declaring the plant open, said it had given the utmost satisfaction since it had been working; and the Committee had every confidence that when it was thoroughly dried and operating at higher pressure next winter, it would be able to meet all the town's requirements for some time to come.

Mr. BROADHEAD remarked that the Batley plant was not notable for special features, except that in erecting a vertical installation in a house originally used for inclined retorts there had been surplus accomodation, which had been utilized by the arrangement of the mess-room in the same building, surmounted by the coke-hoppers, with delivery shoots straight into road vehicles in the yard. Mr. Broadhead then presented to Alderman Stubley a handsome silver cup, as a memento of the occasion.

As an exemplification of adaptability, this installation is a good illustration, for inasmuch as the site originally gave a carbonizing capacity of but 600,000 c.ft. with the horizontal retorts, by simply extending the existing walls—and all (as it were) under one roof—there now exists:

(1) A 1,000,000 c.ft. vertical retort installation.



600,000 C. FT. HORIZONTAL RETORT-HOUSE ADAPTED FOR THE 1-MILLION VERTICAL PLANT.

(2) A 600,000 c.ft. complete gasification plant, and coal storage for same.

(3) A power-house for engines and blower.

(4) A 200 ton (or 4 days') overhead storage for coke.

(5) A well-appointed mess-room, lavatory, and bathroom for stokers.

(6) A week-end bunkerage for coal and coke.

(7) A four-way means for handling coal and coke.

This compactness of the grouping gives rise to great efficiency in everyday working.

Coal-Breaking Plant.—Coal arrives by mechanical road vehicles, and is cleanly discharged into a 6-ton capacity receiving hopper beneath yard level. The breaker-pit is furnished with a reciprocating feed regulator, screen, bye-pass shoot, and four-roll breaker, delivering to the boot of elevator. Thus only coal which is too large for use is passed through the breaker, whereby slack formation is prevented, to the advantage of carbonization. The breaker is driven by a clutch from the line-shaft, so that it is dormant when nut-coal contracts are running. The feed is driven by the motion of the elevator. Hence the coal-breaker is caused to run empty should the elevator stop from any cause whatsoever, thus overcoming any risk of breakdown from chokes.

Coal Handling (30 *tons per hour*).—To have alternative means of handling the coal up to the overhead storage bunkers is obviously desirable. In this installation (owing to its aforesaid compactness) it has been possible to arrange for four independent ways, namely: (1) *Via* elevator, auxiliary hopper, and truck to compartments of hoppers. (2) *Via* elevator and top strand of

gravity bucket conveyor to compartments of hoppers. (3) *Via* hoist and truck alone from ground to compartments of hoppers. (4) *Via* lower strand of gravity bucket conveyor by simply shovelling (in emergency) the coal into the buckets. It should also be observed that this beneficial function has been obtained with no idle stand-by plant, all being kept in daily work and therefore in working fettle at all times.

Coke Handling (*20 tons per hour*).—Since coke still retains its premier position as the chief residual product of carbonization, its gentle and efficient handling remains an important factor of gas-works economy. This feature has in this installation been fully realized, the means employed being: *Via* gravity bucket conveyor and direct from retorts—(1) to screens, (2) to bunkers over furnaces and retorts. *Via* hoist and truck and direct from retorts—(1) to screens, (2) to bunkers over furnaces and retorts.

Coke-Storage Bunkers (*200 tons, equals four days' storage*).—As is well known, coke deteriorates considerably when tipped and shovelled from the yard. Hence these are features to be avoided in a well-equipped and modern plant. The bunkers here are formed of reinforced non-corrosive brickwork walls, surmounting the mess-room, lavatory, and the existing stone walls of the horizontal retort house, and are compartmented, so that the gently-carried coke from either of the handling plants is screened and stored, ready for delivery into road vehicles, from a battery of delivery shoots. The breeze content with this installation is so small as to be insufficient to fire the boilers; and the economy of such big storage entails that the coke is dealt with wholly under cover. There is no yard storage; and the Manager can sub-divide his labour to the greatest economic advantage.

The Retorts.—The top mouthpiece is furnished with three turned spheres, to admit of probing the whole area of the charge, and also with a two-hour capacity coal-bin. A feature of the system is that the coal gravitates centrally into the retort, whence by natural selection from whatever coal is in use, a pyramid of coal is formed. The nuts roll down to the sides or corners of the retort. The dust is retained in the centre, whence (as the process is continuous) a balanced free-moving charge is formed, giving uniformity of carbonization, equal shrinkage, and an even descent. Also, two free spaces are obtained, thereby equalizing the rising flow of water gas in each half of the retort, for best carbon and time contacts. Theoretically, the taper of vertical retorts should be proportionate to the variously expanding charge. Practically, an accelerated taper is adopted, giving the maximum taper at the top, where coal is swelling, and the minimum taper at the bottom, where the coke is shrinking. The efficiency of vertical retorts depends on the continuity of the descent of the charges. Hence an even distillation to prevent tilting of the charge is beneficial; and this is accomplished by applying the heats in a perfectly symmetrical manner on each broadside of the retort, whence uniformity of distillation of every horizontal cross-section throughout the charge is attained, with equal shrinkage, and the regularity of descent assured.

Coke Extraction.—To cool the coke thoroughly before extraction is of advantage, regeneratively, for the extractors, for safe storage, and for direct discharge into storage hoppers. Accordingly there are circulated in the hollow walls of the retort extensions three mediums—namely, primary air for the fire, water vapour for the producer, and secondary air for the setting; and thereby utmost contraction, maximum regeneration, and thorough cooling of the coke are effected.

The egress for coke is 60 in. by 14 in., whence the largest formations of coke can traverse the tray side by side; there being no claws or guiding vanes to constrain or break the coke. The charge rests on the tray at the natural angle of repose; and on the tray slowly receding some 4 in., the coke gravitates down. The two-fold motion engendered overcomes all tendency of the coke to bridge; and the even descent of the charge, as a whole, is maintained with the least attention, and on an even keel.

Size of Carbonizing Unit.—Each tapered retort is 40 in. by 8 in. at the top, 60 in. by 19 in. at the bottom, and 23 ft. 6 in. long, and when on straight coal-gas carbonization has a throughput of 5 tons of coal per diem. When steaming the charge is in use, the throughput falls to (say) 3 or 4 tons, depending on the degree of steaming; but the output of gas remains, or is augmented to 60,000 to 70,000 c.ft. per retort per diem. Four such retorts are grouped symmetrically around one furnace, whereby stabilization of heats is at the outset induced into the system. The group of four retorts with their furnace constitutes the standard 250,000 c.ft. setting; four such settings forming the 1,000,000 c.ft. installation at Batley.

Intimate Steaming of Charge.—Steam pressure is governed for the bench, as a whole, at 10 to 40 lbs. Each retort has a separate stopcock and $\frac{5}{32}$-in. orifice. Each retort by its waste heat dries and superheats its own controlled steam.

Built-up Round-Cornered Retorts.—To combine the advantage of the rounded shape of moulded retorts with the resilient strength of built-up retorts, the specials are grooved and tongued and span the stay-walls, so that there is no joint (other than bed joints) unsupported by a wall. Thus the maximum strength, easiest working shape, and tightest construction are obtained.

Hydraulic Mains.—The gas yield from each retort is treated individually, inasmuch as each retort is fitted with a separate hydraulic main, gas off-take, dust precipitating chamber, self-sealing cleaning lid, seal-valve, gas-valve, and visible liquor dribble, whereby the best working conditions can be constructed independently for each retort, and over-all efficiency enhanced.

Weak Liquor Circulation.—High and low level tanks are provided. A small steam-pump running very slowly keeps the top tank replenished, the liquor gravitating back through all mains to the lower tank, so that the interior of all mains throughout the installation is maintained with wet surfaces, and any ammonium chloride crystals are immediately dissolved before they can become protected with a coat of tar.

Power Plant.—Gas-engines are used, two 44 H.P. and one 4½ H.P., interconnected in the most interesting manner—either all three engines are available for driving the coke-extractors or the two large engines may each drive the hoist, gravity-bucket conveyor, and breaker-pit machinery. By withdrawing the clutch, the line-shaft is separated into three independent shafts, as follows: One large engine is left to run the hoist, the other to run the conveyor and breaker-pit machinery, and the small engine to run the coke-extractor mechanism. Thus the whole of the shafting can be overhauled without in any way interfering with the working of the plant. It should be further noted that, as one or other of the engines is running throughout the night and day, the shafts are so interconnected that each engine can act as starter to its neighbour, which increases the elasticity of the use of gas-engines.

Power-House.—The appointments of the power-house as a whole are such as to show by precept the advantages of the use of gaseous energy as a prime mover, and are a fine example to the district, which includes many users of power. A visit enables the engineer not only to demonstrate efficiencies, but to give object-lessons in the utility of town gas as everyman's power.

Mess-Room, Lavatory, and Bathroom.—The personal efficiency of the stokers is well provided for by a particularly fine set of well-lighted and well-appointed offices. These are grouped under the coke-hoppers; the glazed side enabling the stokers to have the bench under observation from the mess-room. The whole being under the one roof, there is no need for the men to leave the retort-house to use the room.

Gravity Bucket Conveyor.—This type of conveyor carries the coal or coke, whence dust, breeze formation, and wear-and-tear are at the minimum. The buckets are readily detachable, without disconnecting the chains. The chains are twice the normal pitch—viz., 2 ft. centres. Hence there are only half the number of knuckle joints and rollers, correspondingly reducing the attendant wear, stretch, and lubrication required. A steady motion of this long-link chain is imparted by means of the eccentric spur gear, Dempster-Toogood patent, which compensates for the irregularities due to the hexagonal driving drums. The conveyor makes a complete circuit in six minutes, and by means of the semi-auto oiler every joint can receive thorough lubrication in this short space of time by the attendant.

Hoist (*2 tons capacity at 80 ft. per minute*).—To act as a spare plant to the gravity-bucket conveyor, to give ready access to all parts (additional to the main staircase), a belt-driven hoist and a special ball-bearing truck are provided. The hoist is grouped in longitudinal alignment with the bench, whereby all turntables or right-angled curves are dispensed with. As the loaded truck always moves in one direction, the truck-rails are laid at an inclination to and from the hoist, whereby time and effort in handling this large load is economized. The hoist cage is furnished with the firm's patent trip gear and hinged rails, so that the truck-rails (landing and cage) are always in exact horizontal alignment, even should the cage come to rest within a margin of 3 in. This overcomes any elasticity in the ropes, and enables the truck to pass to and from the cage with great facility. The cage is also provided with catches to lock the truck automatically within the cage; the truck being released by pressure of the foot.

Facilities for future Additions or Extensions to Carbonizing Plant.—All machinery is grouped at one end of the bench, so that in the future a new bench can be built in the present inclined retort-house, and in longitudinal alignment with the present verticals, so that the truck-rails, foul mains, and strands of the gravity bucket conveyor and platforms can simply be extended over any new installation.

Future Coal Storage.—Similarly a scheme has been considered for extending the gravity-bucket conveyor strands into the inclined retort-house, which would in simple manner fill and empty this house of coal, and thus readily convert it into a very fine and modern type of coal stores.

THE LUNCHEON.

In the Batley Town Hall, luncheon was served to the party—the Mayor presiding over a gathering of some eighty persons. His Worship was supported at the top table by Alderman D. Stubley, Alderman H. North, J.P. (Deputy-Mayor), Mr. J. W. Broadhead, Mr. H. J. Toogood, Mr. R. H. Duxbury, Mr. T. Duxbury (of Oldham, father of the Batley Engineer), Mr. C. S. Shapley (Leeds), Mr. Charles Wood (Bradford), Mr. H. E. Bloor (York), and Mr. T. E. Craik (Town Clerk of Batley). After the Loyal Toast had been given,

HIS WORSHIP extended a civic welcome to the assemblage. He remarked that the town had now got the last word in gas plant. They had had many serious difficulties and trials in recent years; but he believed their troubles were now largely surmounted. They had a plant which would meet all the modern needs of the town.

Mr. T. DUXBURY, proposing "The Batley Gas Committee and Undertaking," said he was proud to be the father of the Batley Gas Engineer. [Applause.] He himself had been thrown into contact with the Batley Committee a good deal during the construction of this plant; and he knew the difficulties the department had had to contend

with, during the past two years in particular, and probably more. The Batley Gas Committee recently had been going through what the industry as a whole went through during the war period. He complimented the Committee, and the Chairman in particular, on the real businesslike interest which they had taken in the needs of the situation. He was confident that Batley had done well to instal the Dempster-Toogood plant, with which he himself, at Oldham, had had the utmost satisfaction. They claimed at Oldham to be almost the pioneers in the use of the Dempster-Toogood system, though he believed Mr. Wellens, when he was at Hebden Bridge, forestalled them a little. Oldham, at any rate, were the pioneers in million cubic feet plant. The Batley Corporation, in his opinion, had got one of the best installations in the country. ["Hear, hear."] He thought the general arrangement on the site must have impressed the practical gas engineers in their inspection. The Committee and the Contractors were to be congratulated on having got the work through in so short a time. He did not think, in his own forty years' experience, he had known so much work carried out in so short a time. Speaking of the state of the gas industry as a whole, he did not think there was ever a better prospect for gas than at the present time. The Gas Regulation Act, the abolition of the old standard of illuminating power, and the adoption of any calorific value they wished to adopt, gave them now a free field for invention in retorts, in complete gasification, and in every system which might forward the most economical method of gas manufacture. They must keep always in view the cultivation of users of industrial gas. It behoved every gas engineer to make a special study of the possibilities of applying gas to the industries of his own area. For industrial purposes, they could more than compete with any other form of power on the market, if they set themselves about the matter in a proper manner. Far too much money had been taken from undertakings in relief of rates in the past. He had gone into this matter fully for 25 years; and his late brother had fought the question at Darwen for many years—a long period—because there they had taken money from the gas-works for the rates even though the works made a loss. In Oldham, the Gas Committee were up in arms against the Finance Committee on this question. The taking of money from gas undertakings to the aid of rates simply meant that people and factories using electricity got the benefit of the earnings of a department which they did not help to support; and it was not fair. In Oldham, the Gas Department was the only one which gave money in relief of rates; and it was unfair that gas consumers should be burdened in order to hand over money to people who did not use gas.

Alderman D. STUBLEY, responding, said the Batley Gas Committee had great hopes of the new plant—especially as industrial conditions were now returning towards stability. In 1914 they had almost decided on a new installation; but the war came, and the whole matter had to be shelved. They were urged not to incur new capital expenditure until the war was over, so they carried on; but once the old plant began to give way, it was clear that they were not far off a final collapse. There was just one drawback to the fine new plant—that their capital charges would have to remain very high for some time to come. There had been no hitch from the start of the work; and the greatest credit was due to Mr. Duxbury and to the Contractors.

Alderman H. NORTH, proposing "The Visitors," said Batley had a good Town Council and a good set of officials; and therein lay the making of a successful community.

Mr. H. E. BLOOR, replying, remarked that one of the finest traditions of the gas industry was the readiness of engineers to help other gas engineers by advice and assistance, or by facilities for visits to plant. There was always room for marked differences of opinion as to which was the best type of plant; but this was explained largely by variation in local circumstances. Batley had a fine plant; what they wanted now was a still finer consumption. One of the most notable factors of the gas industry was the devotion to it of several very famous families in the industry; and Batley had the advantage of a member of one of these families in their Engineer, Mr. Duxbury.

Councillor J. DEARY (Vice-Chairman of the Gas Committee), in submitting "The Contractors," said he was glad of the chance to express publicly his appreciation of the way the work had been carried out.

Mr. J. W. BROADHEAD, replying, said the firm were gratified at the many expressions of congratulation on the plant. The firm were glad to be given this important contract, under, he believed, severe competition. It was a compliment to their system, because the Engineer and his predecessor had seen the system in operation at Oldham, and would not have asked the Corporation to put up the Dempster-Toogood plant had they not every confidence in it. The firm were proud to have "discovered" Mr. Toogood, the inventor. They were pleased to have with them that day Mr. E. J. Wellens, who had, when at Hebden Bridge, persuaded his Board to put in what really was an experimental Dempster-Toogood plant. The firm had just completed an installation of 2,250,000 c.ft. capacity at Accrington; another of similar capacity was drawing to completion at Leeds; and a third was of 3,000,000 c.ft. capacity, for the Great Western Railway Company at Swindon—the whole of this one being for industrial purposes. He was confident that Batley Corporation would never regret installing the Dempster-Toogood plant; and he expressed his firm's indebtedness to Mr. Duxbury for his guidance and assistance in the work.

The MAYOR voiced the Gas Committee's appreciation of Mr. Duxbury's services, and proposed his health. Mr. Duxbury had taken charge at Batley at a time of extraordinary circumstances in the department; and they appreciated his work, and also the advice which had been given them by Mr. T. Duxbury.

Mr. R. H. DUXBURY paid tribute to the personal interest taken in the work of erection of the new plant by the Chairman of the Gas Committee, often at severe sacrifice of his own time. From the start the installation had been entirely successful. Though the plant had been in operation since November, it had only been working as a separate unit for the past fortnight. As far as could be ascertained so early, the plant was making well over 75 therms per ton of coal, of 440 B.Th.U. gas. He also paid tribute to the loyal work of the staff of the department during what had promised to be a rough time, but which, fortunately, had turned out to be devoid of trouble, owing to the happy relationships between the regular staff and the Contractors.

EFFECT OF GAS UPON PLANTS.

A paper was read last Friday, by Prof. J. H. Priestley, of Leeds University, before the Association of Economic Biologists, on "The Toxic Effect of Illuminating Gas upon Plants." The following notice is taken from the "Yorkshire Post."

This paper is the result of experiments made by the Professor and his assistants and students in the Botanical School of the University. Apart from their intrinsic value and their practical bearing, the experiments are interesting, because they are the first serious attempt to deal with the matter in this country. Prof. Priestley does not mention another part of the experiment, which consists of bubbling gas into water in which are growing onion bulbs. When the writer visited the greenhouse at the University he saw these bulbs, and it was possible to detect the alteration in the roots, similar to that described in the case of the etiolated pea plants, although the gas had only just been introduced into the water.

Prof. Priestley said it had been known for many years that the presence of very small traces of unburnt coal gas in the atmosphere might produce a harmful effect upon growing plants under certain conditions. German observers were the first to notice how very sensitive "etiolated" shoots (the shoots of plants grown in continuous darkness) of the pea or potato or many other plants were to the presence of traces of gas. American workers had since extended these observations, and had shown that traces of coal gas in the atmosphere or the fumes from cigarette smoke or from smouldering paper might have a very deleterious action upon plants, especially upon such etiolated shoots. Both German and American workers agreed that the deleterious effects could be traced to the gaseous unsaturated hydrocarbons, such as ethylene, always present in such fumes. If etiolated shoots or roots were placed in an atmosphere contaminated with coal gas or pure ethylene, they ceased to grow in length, and expanded in girth instead. Examples of such effects upon growing plants were shown; and it was demonstrated that these changes in form could be associated with changes in internal structure, notably with the disappearance of a certain tissue, the functional primary endodermis. This endodermis formed close behind the growing point in both etiolated shoot and in root, and its disappearance seemed to account in large measure for the other structural changes and abnormalities of growth seen in plants poisoned by traces of coal gas. Prof. Priestley pointed out that the disappearance of this endodermis in the presence of fumes containing unsaturated hydrocarbons could be attributed to the displacement by these substances of the unsaturated fatty acids which normally accumulated upon the walls of the developing endodermis, and gave this tissue its characteristic properties. The normal leafy stem growing in the light did not develop such endodermis, and it was interesting to note that such a stem proved relatively insensitive to the presence of these gaseous unsaturated hydrocarbons.

These results, added Prof. Priestley, were of some practical interest in that they suggested diagnostic features by which the occurrence of gas poisoning in horticultural practice might be recognized. The effect was produced by such very low concentrations of ethylene, of the order of one in a million; and although the normal British illuminating gas contained very small quantities of ethylene, toxic effects might be produced by traces of the gas too small to be detected by smell. In fact, the most delicate test we have for a gas leak possibly consisted in the behaviour of etiolated shoots growing in darkness in the contaminated atmosphere. These results might also be of some interest to municipalities interested in the growth of shade trees along urban routes. The gas leaking from the pipes in the soil might be retained around the roots long enough to damage, because of the impermeable nature of the macadam or asphalte on the road surface.

In view of the various building schemes in Leeds and other cities, which include the planting of trees along the roads, the last point in the paper is especially interesting. It may be hoped that in the case of trees dying, or doing badly, the authorities will make use of the information thus supplied by Prof. Priestley, and instead of allowing the trees to die, or spending money uselessly in replacing them, will go to the probable source of the trouble, and repair the gas-pipes.

A New Continuous Tar Distillation and Cracking Process.

A new process which has all the appearance of future success has been perfected and tried-out during a complete week of continuous working at the Glasgow Corporation Chemical Works, under the direction of Mr. W. A. Walmsley (the Manager) and the inventor, Mr. Thomas Wilton, of the Chemical Engineering and Wilton's Patent Furnace Company, Ltd. The process treated and successfully distilled a large quantity of tar, giving an average residue of only 27 p.ct. of pitch, when normally 44 p.ct. would be expected. Particulars and figures will be published by Mr. Walmsley himself at the meeting of the Chemical Society in Glasgow on July 5. Mr. Wilton informs us that the process, which is fully protected in this country and abroad, was primarily designed for use with tar and petroleum oil cracking and distillation; and new plant, which would be working shortly, would treat oil of the latter nature. The plant at Glasgow has a capacity of 50 tons a day of 24 hours, and with a 10 p.ct. water content has shown very remarkable results.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Fuel Research Station.

A long anticipated visit was made last Thursday afternoon—in which between forty and fifty members of the Association took part—to H.M. Fuel Research Station at East Greenwich. From accounts that have already been published, both of the station and of the work being carried out there, it was known, of course, that there was a great deal of extreme interest to be found there; but the visitors could hardly have anticipated that the facilities granted them for making their inspection would be of the very generous character that proved to be the case. On arrival, the members were received by Engineer-Commander J. Fraser Shaw, who welcomed them, and immediately announced that they were free to wander over the place at will, spending as much time as they might choose over those portions of plant and processes which might appeal to them. To aid them in the choice of route, descriptive plans of the station were exhibited in prominent positions, each bearing a printed label with the words "You are here," indicating upon the plan the precise spot on which those who studied it then stood. In addition to this, members of the staff stationed at numerous points were ready to answer all questions and give any explanations that might be desired—and it may be remarked that they were all kept very busy. All present felt that they were greatly indebted to Sir George Beilby (Director of Fuel Research) for permitting the visit, and to those who had made such complete arrangements to ensure its success.

Members of the Institution of Gas Engineers visited the station twice last year; and after the first visit at the end of June, a lengthy description of what was to be seen there appeared in the "Journal" [July 6, 1921, p. 24]. Of the general features of the station, an account, taken from one of the reports of the Fuel Research Board, had previously been given in the "Journal" for April 27, 1920 [p. 191]. It is unnecessary to repeat now what was said on those two occasions; but it may be remarked that all the plant, &c., which was then referred to was closely examined at the station by the visitors during their inspection last Thursday. Much time was, of course, spent over the Glover-West vertical retort installation and the Humphreys and Glasgow water-gas plant, as well as on the set of horizontal steel retorts specially designed with a view to the obtaining of accurate data on the subject of low-temperature carbonization. There were placed for examination (so that their good condition might be seen) a couple of these mild-steel retorts, which had been removed from the setting after six months' use at 600° C. Carbonizing crushed coal in the divisioned trays described on previous occasions, at this temperature, the products were stated to be 3000 c.ft. of gas, of 900 to 1000 B.Th.U.; 16 gallons of crude tar; 15 cwt. of coke (smokeless fuel). These steel retorts, like the vertical settings, are heated with blue water gas. For experimental purposes, 100 lbs. of coal is retorted, and the gas passed through complete plant of a very small size into a 200 c.ft. holder, from which it is drawn in the laboratory for testing. Attention was also devoted to an experimental low-temperature retort with a throughput of 1 ton per hour, on the continuous principle—the pulverized coal being discharged at the end of about 3½ hours in the form of moulded briquettes. Here the yield per ton is given as follows: Gas, 2600 c.ft. of 925 B.Th.U.; tar, 16 gallons; smokeless fuel, 15 cwt.; and sulphate of ammonia, 7 lbs. As Dr. C. H. Lander recently announced, they are at the Research Station now in a position to make tests and to pronounce with confidence as to the suitability or otherwise of any given coal for carbonization at temperatures of from 500° to 650° C., and to determine the proportions in which the more and less fusible varieties of coal should be blended in order that the most satisfactory results may be obtained. As the direct outcome of the experimental work carried out at the station, low-temperature coke has been regularly produced on a works scale in the form of cakes which are sufficiently robust to stand the rough handling of transport. The visitors were able to examine samples for themselves, as well as to see the fuel burning in a grate.

In connection with the blue water gas manufacture, a dust extractor has been put down, in which the gas passes between a series of wood partitions, in intimate contact with water. A Kirke boiler was seen; a Lancashire boiler, evaporation (actual) 4000 lbs. per hour, burning coke on natural draught; and a Babcock and Wilcox boiler, evaporation (actual) 6000 lbs. per hour burning coal, and 4000 lbs. per hour burning coal and coke on the "Sandwich" system. There were placed for inspection samples of machine-cut (air dried) peat, moisture 17 p.ct., with the following stated yields per ton on carbonization in vertical retorts at 820° to 875° C.: Gas, 13,760 c.ft. of 340 B.Th.U., equal to 46·8 therms; tar, 21·3 gallons, 20 p.ct. moisture; coke, 3·34 cwt., 20 p.ct. moisture; and sulphate of ammonia, 24·8 lbs. It was noted that the storage accommodation at the station comprises several small holders, so that the gases from the different portions of the apparatus can be kept separate. Members were much interested in the motor-fuel testing plant, with a Dorman engine and Heenan-Froude dynamometer; and they lingered long in the splendidly equipped laboratories, where there is collected everything needed for tests in connection with research work of the complete character carried on at the station.

Then tea was hospitably provided, after which Mr. D. C. Cross (Lea Bridge) voiced the indebtedness of all present to Sir George Beilby, Commander Shaw, and the members of the staff, for what had proved a thoroughly enjoyable and highly instructive afternoon. What they had seen, he said, had been of engrossing interest; for nothing whatever connected with this beautifully designed station had been hidden from them. The hospitality had been much appreciated. Mr. F. J. Pearce (Mill Hill) having seconded the hearty vote of thanks proposed by Mr. Cross, which was carried with acclamation, Commander Shaw said he was much obliged for this kind expression, which he would certainly convey to Sir George Beilby. As for the staff at the station, their earnest desire was to give all the information at their disposal; and if the members had taken full advantage of this opportunity, the staff were satisfied.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Combined Coal and Water-Gas Plant at Harrogate.

A party of some seventy members of the Yorkshire Junior Gas Association visited the Harrogate Gas Company's works on Saturday last, at the invitation of the Directors and the Engineer and Manager (Mr. F. H. Robinson), to inspect the types of gas-making operations in progress there—Woodall-Duckham vertical retorts, and a combined plant, designed by Mr. Robinson himself, for making coal gas and water gas, thereby producing gas of lower calorific value but in larger quantity, calculated in heat units, per ton of coal carbonized. The occasion was the last gathering before the usual summer adjournment.

The President (Mr. P. McNab) presided over the proceedings generally, and Mr. Robinson met and welcomed the members as they arrived. The large gathering was divided into smaller parties, and conducted over the plant under the guidance of Mr. Robinson, Mr. J. W. Jackman (Assistant Engineer), and Messrs. H. S. Boyes, L. Roberts, and T. H. Brown.

The plant has been described in detail in the "Journal" on previous occasions (Vol. CLIII., p. 335, Vol. CLIV., p. 327); but since then automatic gear has been fitted to the combined coal and water gas setting which was in use as the experimental set, and the Company are just about to instal three additional sets. This disposes entirely with the need for a man standing by; the only operations now required being the charging of the retorts, clinkering the furnaces, and oiling up. The remainder is entirely automatic and fool-proof. The automatic gear, in a cellar-like chamber underneath the horizontal retorts to which the combined plant is adapted, was inspected with great interest by the visitors. Fortunately it had been got ready in time for starting on that same day. The newer settings of the combined plant, following upon the experiences with the original design by Mr. Robinson, have one common ascension pipe to six retorts, thus causing material reduction in the amount of ironwork required. There is one small seal pot, instead of a large hydraulic main.

The visitors were conducted also over the vertical retort-house, the war-time benzole and motor-spirit plant, the purifiers, the engine-house, and the plant generally. The guides explained that the benzole plant was not at present in use; but during the war it yielded spirit both for sale and for the Company's own road vehicles. It was intended ultimately to convert it to use for tar dehydration. The purifiers were admitted to be rather under-sized—four 27 ft. boxes; but they had served very well hitherto, despite heavy pressure, and more were to be put in. From the scrubbers parties passed to the engine-house, where the Company have three "National" gas-engines driving dynamos for generating electricity to supply the power to the entire plant. The engines are one of 32 h.p. and two of 16 h.p. The exhausters in the same house are by Bryan Donkin and Clench, Ltd. The visitors were shown a new boiler-house now under construction, to accommodate three Lancashire boilers, for steam purposes, one of which will be transferred from the old boiler-house. The vertical retort settings were erected in 1914, and the visitors were particularly interested in the cooling arrangement of water-drip pipes instead of the ordinary firebars. In the horizontal retort-house, after examining the mechanism for the combined coal and water-gas production, the parties witnessed charging and discharging of the retorts by the electric charger, and subsequently were shown the blacksmiths' and mechanics' shop, which employs eight men of sufficiently varied qualifications to undertake the whole of the ordinary repairs to all parts of the plant, and also to the Company's road vehicles—three petrol and two steam haulage wagons for coke loading. Coal is brought to the works by a 2-ft. gauge line to the store from the North-Eastern Railway a mile and three-quarters away; the Company running two engines and trains of coal and liquor trucks. The coal-store accommodates some 5000 tons; the coal being run by the wagons on to gantries and dropped into the store, from which, by way of gravity hoppers, it is filled into small trucks, as required, and conveyed underneath the Ripon Road into the works, which are on a lower level than the storage ground. In the works the visitors were also shown a "home-made" tar-distiller, yielding 15 gallons of light oil per twenty-four hours from three tons of tar, heated by a 2-in. steam-coil.

The Visitors at Tea.

The whole party was then entertained to tea by the Company.

The President, in asking for a vote of thanks to the Directors of the Company, to Mr. Robinson, and to the members of the staff who

had assisted in the enlightenment of the visitors, said the Association had seen many interesting plants of one kind or another, but never one more interesting than that of Mr. Robinson—the Manchester Institution representative on their own Association's Council. The plant was decidedly novel to many of the members, and they were all extremely glad to know that the experiment had been found so successful that it was being extended. Mr. Robinson, as the representative of the Manchester Institution on the Yorkshire Junior Association, was not a mere figurehead, but helped in the success of the Association by attending its meetings and taking part in its proceedings. The members of his staff were members of the Association. The visitors that day had had the fullest possible opportunity of obtaining valuable information on the working of the mixed gas plant, and had come just at an opportune time as the automatic gear was starting.

Mr. E. A. LEASK (Leeds), proposing a vote of thanks to the Directors, to Mr. Robinson, and to his staff, said the visit would stand out as one of the most interesting and enjoyable in the records of the Association. Harrogate had many notable features, and the Gas Company's undertaking was certainly one of them. A most striking characteristic of the works was their cleanliness—a factor entirely in keeping with the nature of the town they served so well. The power-house and its surroundings, in particular, were a picture worth going a long way to see. The plant of Mr. Robinson's own design, from the point of view of reducing costs of production, was highly interesting; and the development of this work would be watched very keenly by the members. If production on those lines could be maintained to any great extent, especially on the larger works, it would prove a big step forward in the welfare of the industry. On such a remarkably fine day, it was a great compliment, both to the works and to Mr. Robinson, that there was such a big attendance of members from all parts of Yorkshire. As a gas consumer in Harrogate, quite apart from being engaged in the industry in Leeds, he had no complaint to voice about Harrogate's gas, alike as to pressure, quality, or price. If Mr. Robinson went on and developed his scheme, he would be making history in the gas industry. Mr. Robinson had been put through a very considerable cross-examination that afternoon by the keenly interested visitors.

Mr. J. DEMAINE (Engineer and General Manager, Ripon Gas Department), in seconding, considered the Junior Association were very fortunate in having the opportunity of seeing such a works as that at Harrogate. Mr. Demaine said he had known the Harrogate works for a good many years, and he had always been impressed by their cleanliness. Cleanliness should play a great part on any gas-works, because if they had cleanliness they had a methodical man in charge; and if they had such a man, they had good results. Mr. Robinson's special plant had made considerable strides since he last saw it. He believed there was probably a great future ahead of this type of mixed gas plant for small undertakings, and perhaps for large ones, because the essential to-day was to keep down cost of production,

Mr. H. L. BATEMAN (Wakefield), supporting, said he had taken particular care, in his own career in the industry, to visit every gas-works he possibly could get to, because there was always much to learn. The Harrogate works contained an exceptional assortment of plant, and gave them the chance of seeing three systems of gas production working side by side and in conjunction with one another. He believed if the industry would consider this mixed plant on its merits, there was a great future before it. The principle undoubtedly was on the right lines; and it was a question of weighing up the conditions of each individual undertaking to prove whether the combined plant would be more satisfactory than individual plants for water gas and coal gas.

Mr. ROBINSON, replying, said he was delighted to show the members of the Association his plant, and he hoped they had learned something which would be to their advantage. He believed the plant had beneficial features. The Harrogate gas undertaking was established in 1846 on the present site, though, of course, on a smaller scale. Some of the old buildings were still in use. In those early days every pound of coal had to be carried three miles from the nearest railway station at Starbeck. As the undertaking developed, the transport question became very acute, and sidings were constructed at Bilton Station, a mile and three-quarters away from the works, and the coal was brought from there to the stores—which were across the Ripon Road, just opposite the works—by road-wagons. This involved the Company's having to maintain 1¾ miles of macadam road; and the cost became so great that they built a special 2 ft. gauge light railway to the store. This cost £20,000. The haulage costs over that line worked out at under 2s. to-day, including capital charges. The actual average running costs averaged only about 5½d. per ton. The consumption of gas had grown very rapidly. In 1894, when he (Mr. Robinson) came to the place, the output was 130,000,000 c.ft. per year. Between 1890 and 1896, the works were enlarged to a basis of a million per day, and since then the consumption had steadily grown. In 1914, the whole of the plant was overloaded to the extent of 30 p.ct., and a scheme was got out for a two million cubic feet per day capacity, but was hindered by the war. The plant had since been laid out on the basis of two millions a day, with a view to extension to three millions. The Company had about 10,500 consumers, and the average consumption per meter was over 40,000 c.ft. The price charged was 4s. per 1000 c.ft. net, which he thought compared well with most undertakings. He had no doubt the price could safely be reduced by 6d., but the Company were waiting for the half-year's balance to get the correct figures. The Company believed in experiment within reason. They had experimented in oiling the gasholders instead of painting; and it seemed to be quite successful. They had experimented with tar distillation by the closed steam-coil. They had experimented with the combined coal and water gas plant. In all their work they were out for results; but if they could do anything to advance the industry, they were ready to take their share in this direction. Mr. Robinson, in concluding, said he must pay tribute to the enthusiastic support of the members of his staff.

The twenty-second annual dinner of the Association of Engineers-in-Charge will take place at the Holborn Restaurant next Saturday, with Captain H. Riall Sankey, C.B., C.B.E. (the President), in the chair.

MIDLAND JUNIOR GAS ASSOCIATION.

Annual General Meeting.

The Annual General Meeting of the Association was held in the Council House, Birmingham, last Thursday—Mr. C. F. W. RENDLE (Redditch) presiding. About 25 members were present.

Mr. H. R. HEMS (Hon. Secretary) read the annual report, and Mr. J. H. GEE (Hon. Treasurer) the balance-sheet.

Mr. GEE pointed out that a large number of the members had not paid their subscriptions; and he hoped the matter would receive immediate attention. One unfortunate effect was that, in consequence of this dilatoriness in members discharging their financial obligations, the Committee were unable to recommend, as they had hoped, a lowering of the amount of the subscription.

The CHAIRMAN said it was deplorable that only 30 p.ct. of the members had paid their subscription, which was quite nominal. He hoped it would be realized that those who paid, actually did so for those who defaulted.

The report and balance-sheet were formally adopted.

NEW JUNIOR VICE-PRESIDENT.

The CHAIRMAN observed that it was felt by the Council that those representing the distributing side of the industry should on this occasion receive special consideration in regard to appointing a new Junior Vice-President. The name of Mr. H. Clark, Distribution Superintendent at Derby, had been mentioned; and he had expressed his willingness to accept office.

Mr. J. Poulson (Stafford) and Mr. W. H. Reed (Warwick) retired by rotation as members of the Council; and the meeting elected to the vacancies Mr. S. W. Simmons (Derby) and Mr. C. F. Tooby (Coventry).

The CHAIRMAN said he had pleasure in announcing that Mr. H. R. Hems and Mr. J. H. Gee had consented again to act as Hon. Secretary and Hon. Treasurer respectively. Their public spirited offer to continue in office was much appreciated. ["Hear, hear."]

The meeting approved these appointments; and, on the motion of Mr. SIMMONS, seconded by Mr. A. KENDRICK, a vote of thanks was passed to the retiring officers; and a similar acknowledgment was made to Mr. W. P. Timbrell of his services as Hon. Auditor.

The Carbon Black Industry.

According to a report by Mr. E. G. Sievers, of the United States Geological Survey, the carbon black industry showed marked progress in 1921—the estimated total output having been 14 p.ct. greater than in 1920. The centre of the carbon black industry is Louisiana. In the earlier days of the industry, the centre of production was in Pennsylvania; but afterwards it shifted to West Virginia, which was long the leading producer. Then, as the supplies of natural gas in the eastern fields declined, and new fields were developed in Louisiana, the industry migrated to this fresh territory, where the supply of gas was large and cheap. The average yield of carbon black per 1000 c.ft. of gas consumed was slightly lower in 1921 than in 1920, though the efficiency of some of the plants had been materially increased. The yield in 1921 ranged from 0·2 lb. to 3·5 lbs.; and the maximum was 1·5 lbs. higher than the maximum in 1920. Of the total output, it is estimated that from 20 to 25 p.ct. is used in the manufacture of printers' ink; while from 30 to 35 p.ct. is employed in the rubber industry, serving chiefly as a reinforcing agent. The Department of Conservation of Louisiana have formulated rules requiring the extraction of gasoline from the gas before burning in the carbon-black plants, though in some parts of the fields the gas is too low in gasoline vapour to warrant its extraction. A considerable quantity of carbon black is exported from the United States.

A "Raw Materials Review."—A welcome is extended to a new monthly record of trade and industrial intelligence at home and overseas, which has just made its appearance under the title of the "Raw Materials Review and Manufacturers' Gazette." It has been founded by Captain R. B. Crewdson; and an excellent first number has been produced by the Editor, Dr. Edouard Luboff, F.R.E.S. His aim is to supply specialized information on the important subjects with which the Review deals; and published messages prove that this aim is meeting with high appreciation in influential quarters. These messages include one from Col. O. C. Armstrong, D.S.O., the President of the Federation of British Industries, and another from Sir Peter Rylands, Past-President of the Federation. Glancing through the contents of this first issue, one notices an eminently appropriate article on "The Minerals of the Empire," by Sir Richard Redmayne, K.C.B., M.Sc., M.Inst.C.E., F.G.S., the Chairman of the Governors of the Imperial Mineral Resources Bureau, who urges that we should know exactly where we stand in respect of our mineral resources—where the different kinds of minerals occur, of what quality they are, and what is their extent. The next step is the dissemination of the knowledge of these resources, so that the possibilities may be known and understood. It should be mentioned that the price of the review is 1s., and that it is published at No. 14, New Bridge Street, E.C.

SOME REMARKS ON LOW-TEMPERATURE CARBONIZING.

By Harald Nielsen.

[Extracts from a Paper presented to the South Wales Institute of Engineers, Cardiff, April 20.]

In a recent lecture on "The Fuel Problem,"* Dr. C. H. Lander, of the Fuel Research Board, said:

It is necessary to lay stress upon the wide difference between the solution, on the one hand, of some local problem of carbonizing under low temperatures materials which are of the nature of waste products, commanding only a low price on the market, and, on the other hand, the design and production of an apparatus which would solve the national problem by showing a profit when working on a material such as domestic coal. The latter is infinitely more difficult of solution than the former, since the raw material of the process forms the principal competitor of the finished product, and the margin for working is necessarily small.

In these words, Dr. Lander summed-up the whole low-temperature carbonizing problem in this country. Reading between the lines, the all-dominating factor, the cost of production, stands glaringly out. It invariably means the difference between success and failure, whether it is a question of any local problem or a bid for the solving of something much bigger.

Let us, by means of the most elementary mathematics, examine the cost of production factor. This in reality will be a sum made up from the following simple items:

(1) Capital cost of plant and depreciation on same.
(2) Fuel required for carbonizing.
(3) Cost of handling the raw material and solid residue.
(4) Power and steam.
(5) Labour.
(6) Maintenance of plant and stores, &c.

Production cost is therefore $1 + 2 + 3 + 4 + 5 + 6$, and naturally the lower the individual items can be brought down in any particular system, the better the chances are of successful competition.

(1) Does not require much comment—the importance of low first costs is very apparent.

(2) Represents the amount of B.Th.U. in the form of solid or gaseous fuel for which the B.Th.U. in the final products are eventually debited; and it is probably not a well-known fact that the amount of heat theoretically required to carbonize a given quantity of ordinary bituminous coal is not more than 2·5 to 3 p.ct. of the heating value of the raw material.

(3) Means the cost of handling of all solid materials; and this should naturally be done mechanically and without the aid of manual labour. It stands to reason that the simpler the process is, and the greater the units, the less these charges will be.

(4) The power and steam requirements are in all probability of practically the same order for any well-designed plant, irrespective of the various systems. At any rate, the differences may be neglected.

(5) The labour required is, however, one of the most important items; and it is clear that the processes which are continuous in operation and consist of large units, where everything goes forward without being touched and handled by man, have a distinct pull over processes run intermittently, and consisting of smaller units. It should be possible to design plants on such lines that all the "labour" required for (say) a throughput of 200 tons per twenty-four hours or more would be a well-paid gas chemist or gas engineer, one mechanic, and a labourer. Efficient machinery can only be run by efficient men, knowing the ins and outs of the process from beginning to end, who have had a practical and scientific training, if the highest efficiency is to be obtained.

(6) The process should be one which would require a simple plant only, and one which can run month in and month out under even working conditions, and where the simplicity is so great that nothing can go wrong, and no internal moving parts are subjected to any high temperature.

Most of the above remarks may seem absolutely obvious and unnecessary to lay stress on at a meeting like this; but, believe me, the more obvious a thing seems to be, the more difficult it is to see it in its true colours, particularly in low-temperature carbonizing.

The true low-temperature carbonizing problem is, according to my views, so entirely different from high-temperature carbonizing that it appears that the proper solution cannot possibly lie along the same lines; and it will only be a waste of time and money to try to solve the problem on these lines, from an economic point of view. I will even go so far as to say that the past experiences and vicissitudes of low-temperature carbonizing seem to support my views.

As it took over a century to bring high-temperature carbonizing up to its present stage of perfection, it is not to be expected that low-temperature carbonizing can be solved in a year or two; and I do not think that anybody at present can justly lay a claim to have done so from every point of view. I will only say that the new lines some of us are working along seem to promise a fair chance of leading to the coveted goal.

I will only make a few more remarks, aided by some more simple mathematics, as to what I consider is the first and real problem facing the investigators—namely, that of transferring the heat necessary for the distillation of the coal from the heating medium to the coal in as short a time as possible. The amount of heat transferred can, according to ordinary rules, be expressed as B.Th.U., or kilogram calories, per unit of area of heating surface per degree of mean temperature difference per unit of time, multiplied by the transfer coefficient and value of the thickness of layer, or, in other words, when C represents the amount of heat to be transferred:

a = area of heating or contact surface.
d = mean temperature difference.
t = unit of time.
k = transfer coefficient or resistivity coefficient of thickness to be penetrated.

The whole transaction takes place according to formula $C = a \times d \times t \times k$.

It now remains to be seen which combination of $a \times d \times t \times k$ will give the best result from a practical and economical point of view. k cannot be altered, because to a certain material belongs a very certain transfer coefficient. Further, bearing in mind the nature of the distillation, d can only be varied within comparatively narrow limits. There remain then only a and t. Of these two, t governs the throughput of the plant, and cannot, therefore, be prolonged beyond a certain limit—generally six to eight hours for low-temperature carbonizing in externally heated retorts. a, therefore, remains; and it is particularly here that there is room for improvement.

The prevailing practice has been to subject the coal to carbonizing in as thin layers as possible, from 3 in. to 4 in. thick, in order to present as large a heating surface as practicable, and shorten the passage-way of the heat as much as possible. The limiting factor of the thickness, or rather thinness, of the coal layer is the behaviour of swelling coal and the ease in discharge of same (and all sorts of ingenious mechanical devices have been proposed), as well as the capital costs and great working costs of a large number of very small units (say, less than a ton per charge).

The formulæ and the values in same as they will appear as far as externally heated low-temperature retorts are concerned will in general practice be something like these for the throughput of a charge:

a = the outside definite area of the retort.
d = 550° to 700° C. (maximum).
t = six to eight hours.
k = $q \times$ about 3 in. to 4 in. thickness.
(q = the transfer coefficient per unit of thickness of material).

The result of the above is a low-temperature coke containing a varying percentage of volatile matters, from 5 to 15 p.ct.

When the raw coal is subjected to low-temperature distilling in retorts heated internally by means of producer gas, water gas, or inert combustion gas, naturally the same formula $C = a \times d \times t \times k$ applies; but the different factors assume quite different values:

a = the total outside surface of each particle of coal, which totals up to many times the outside area or heating surface of any retort.
d = the mean temperature difference, which can be considerably lowered or maintained at wish.
t = from two to three hours for pieces up to 3 in. cube, and correspondingly less for smaller pieces (volatile contents afterwards not varying more than 1 p.ct. maximum).
k = $q \times$ a maximum of 1½ in., as the largest piece—*i.e.*, 3 in.—is surrounded on all sides by the heating medium.

The result of the comparison between the two methods is that, owing to factor a being so many times greater in the latter case, k more favourable, and d remaining unaltered, t is brought down very considerably—*i.e.*, down to about 2½ hours, which has been times out of number confirmed by tests on a large scale.

It will be clear that, by shortening the distilling period one-third to one-half, the standing radiation and convection losses are cut down enormously, and the throughput of the plant increased *pro ratâ*. Also that the only limit to the practical size of the retort in which the coal is distilled by the sensible heat is the practical difficulty of constructing a rotary retort large enough to deal with the potentially large output rendered possible by this practically unlimited heating surface made available by the coal or presented by same for attack. At any rate, the largest single retort unit in the world—namely, 100 tons throughput per day—is now being rapidly completed for distilling coal by the sensible heat of producer gas; and this is by no means the last word.

In connection with some remarks regarding the gas produced by various temperatures from average suitable bituminous coals, the author showed a diagram indicating the approximate relative composition of the gas, and the percentage of the main constituents of the gas, under low-temperature conditions, as given off by a bituminous coal particle during a distillation period of up to four hours. From this, he said, it would be clearly seen that the most valuable constituents—*i.e.*, CH_4, C_nH_m, and CO—reach their maximum values during the first two hours of treatment, and then gradually decrease, while the hydrogen constituent increases as the distillation goes on. Just over 2½ hours, the methane curve cuts the hydrogen curve; so there is every reason for suggesting that the period of distillation should not be carried much beyond

* See "Journal," Vol. CLVII., p. 706.

this point, provided the carbonizing of the coal could be effected in that time, which is only possible if sensible heat distillation is employed—that is to say, internally heated retorts. If externally heated retorts are used, it would mean that the coal layer should not exceed 1½ to 2 in. in thickness, which is not a practical proposition at all.

Referring to other curves, he said it naturally stood to reason that the increasing hydrogen percentage would reduce the specific gravity of the gas. Particularly the fall between the first hour and the third hour of the distillation was noteworthy; and with the fall in specific gravity, the fall in heating value per unit of volume follows. Two curves indicated the relative gas production by internally heated and by externally heated retorts. The curve belonging to the internal heating rose much quicker to a maximum, and fell far more abruptly than the other more protracted curve. In the first case, between 75 to 80 p.ct. of the total volume of low-temperature gas is given off in the first 2¾ hours; and 70 to 75 p.ct. of the gas produced by externally heating is given off in the same period. These facts should also point in the direction of its being advisable to discontinue distillation beyond two or three hours' maximum, if the retorting process would lend itself to such purpose; and there, again, it appears as if low-temperature carbonization can only be carried out effectively by sensible heat in this short time.

Practically, continued Mr. Nielsen, all our carbonizing tests have been carried out by means of the sensible heat of producer gas. Naturally, any gas not containing free oxygen, or only a very small percentage of it, can be used equally well. For instance, water gas superheated to the right temperature by means of the combustion of a certain amount of the blow gases in generators is very suitable, and will bring the problem of complete gasification for town-gas purposes to a successful conclusion.

In the "GAS JOURNAL" of Nov. 2 and 9 last year, and also of Feb. 1 this year, a complete thermal balance-sheet appeared, into details of which I need not go here. The possibilities of utilizing low-temperature carbonizing by sensible heat of producer gas in conjunction with gas production for steel works, have been fully dealt with in "Engineering" of March 24 this year, where a complete description and details of plant and processes are given, together with a thermal balance-sheet.

Low-temperature carbonizing in bulk by means of sensible heat of gases lends itself admirably to practically every fuel proposition. If, for instance, it is a question of producing a solid smokeless fuel with oil and bye-product recovery, and there is a market in the vicinity for the gas produced, then the sensible heat of producer gas should be used for carbonizing, as in this way 35,000 to 40,000 c.ft. of mixed gas of a value of well over 200 B.Th.U. per c.ft. is obtained per ton of coal treated.

If there is no market for the gas produced, then producer gas should not be used continuously for carbonizing, as the fuel will be too big an item. The proper thing to do will be to start-up the plant and effect the first carbonizing with producer gas; and after the first two hours' run, the producer gas should be combusted in reheaters, and the stripped gas from the tail end of the plant should be passed through the reheaters in counter-current to the combusted producer gas, and superheated up to the necessary temperature, and then passed through the retort for carbonizing the coal. As a surplus of gas is generated the whole time, a corresponding amount of gas will have to be taken away continuously, and when combusted under boilers will raise all the steam required for the producer and for the engine driving the retort and auxiliaries.

The returned gas is practically saturated with oil vapours, so that the yield of light oils from the gas in the wash-towers will be greater. I think, however, that a slight cracking of oil vapours contained in the gas might take place by passing through the reheaters, and the composition of the gas altered a little; but from the point of heat-carrying capacity of the gas per unit of volume, I do not think that this slight drawback will mean anything, as the specific heat of the various components of the gas is for all practical purposes the same at about 800° C.

It stands to reason that the same procedure should be adopted if it is a matter of distilling oil shales or other carbonaceous materials, where it is a question of keeping the fuel down because there is no commercial outlet for the gas produced.

If it is a question of producing gaseous fuel and recovering the oils and ammonia, all the coals should be carbonized by producer gas, and the mixed gas should be oil-stripped. All the solid residue should be gasified in producers, with or without bye-product recovery; and the total gas obtained per ton of coal originally put into the plant would be about 90,000 to 100,000 c.ft., of a value of 175 to 185 B.Th.U. per c.ft. net.

I have already referred to the possibilities from a town gas point of view of complete gasification by means of water gas, and given the necessary references elsewhere. We are only at the beginning of things as far as low-temperature carbonizing is concerned. But I can see the dawn of a new era; and it is up to us to put all our brains together, and pull together, and work with a will, without jealousy, because proper team work is what is wanted. I know that the authorities, through the Fuel Research Board, are very much alive to the fact.

Alderman William Henry Delves, who had been for many years Chairman of the Tunbridge Wells Gas Company, and who died last month in his 93rd year, has left estate of the gross value of £25,012, with net personalty £22,745.

THE LOW-TEMPERATURE CARBONIZATION OF COAL, &c.

By W. EVERARD DAVIES.

[**A Paper presented to the South Wales Institute of Engineers, at Cardiff, on Thursday, April 20.**]

What are the reasons for the existence of a low-temperature system of carbonization?

1.—The useful recovery as gas, oil, and motor spirit and other bye-products of the volatile ingredients of bituminous and other highly volatile coals, which would otherwise be wasted by inefficient combustion processes of the coal in the raw state.

2.—The production of a smokeless solid domestic fuel, resulting in abolition of smoke.

3.—Taking advantage of the commercial possibilities involved in the process of carbonization, which raises the raw fuel into forms of higher availability and value, by making the same partial in its degree of treatment, rather than complete, and thereby extending its applicability to a wider range of fuels than is possible with high-temperature carbonization for coking, which is limited to coking coals (furnace or gas coke), and further which, owing to its specially developed state and suitability for fulfilling its express objects within its own particular sphere, rules out of court any possibility of low-temperature carbonization displacing it therein, although permitting it to contribute features of advantage along synthetic lines, involving mixed processing.

The development has, however, been slow, which may be ascribed to three main causes:

(1) The slow evolution of suitable retorting apparatus.
(2) The inadequacy of our knowledge of coal composition and thermal decomposition.
(3) The non-existence of a market for the rather special products.

The writer thinks it important to have a clear understanding as to what really constitutes low-temperature carbonization. If the interpretation is limited to that of heating a charge of coal at 500° to 600° C., then in his opinion the procedure can be dismissed as of little and limited importance and consequences; whereas if extended to mean "partial carbonization," wherein the products of distillation are prevented from exposure to more than 600° to 800° C., as the case may be, whatever the mode, rate, and intensity of heating may be, then the proposition may indeed be raised into the sphere of practical utility.

The writer disagrees with the limitations hitherto imposed on low-temperature systems respecting the heating temperature, which, given safeguards as to conservation of the distillate, may far exceed 750° to 800° C. in the heating flues, and yet give the characteristic low-temperature yields of gaseous and liquid products. But he agrees 750° C. or thereabouts should be observed as a maximum average charge temperature.

The fulfilment of the heating requirements of low-temperature systems of carbonizing, in securing the distillate from secondary decomposition, and in yet realizing a high heat transmission rate in order to assure a commercial throughput, can, in the writer's opinion, only be fully and sufficiently obtained, to make the system an unqualified success, by the combination of external and internal heating effected in the Everard Davies system.

Further, the production of a smokeless coalite having a hard dense, porous structure, suitable for withstanding reasonable transport, is facilitated by quick processing, whereas by prolonged heating and fusion the difficulties inherent in intumescence are liable, if the material is caking, to interfere with the production of a suitable product, as well as to encumber the process in many other respects; but with quick processing, accompanied with a ready outlet for the distillate, preferably under suction, along a path always decreasing in temperature in the outgoing direction, intumescence is facilitated with low-caking materials, controlled with good caking quality material, and reconsolidation into a hard, compact, solid residue ensues.

In order to realize a physically satisfactory coalite, also of maximum calorific power, it is essential to divide the processing up into stages, which in our retorts is effected by zoning of the heating and off-take arrangements, so that the time required for reconsolidation after intumescence has been completed may be ample. With slow external heating methods, no more than 25 to 15 p.ct. of the period is available therefor, whereas by quick processing, by combined external and internal heating restricted to one side of the descending charge, 30 to 50 p.ct. of the period becomes available, even when the total period is reduced for throughput reasons. This is due to the action of the internal heating over and above 550° but under 800° C. in effecting an early hardening of the charge, with reduction of the fusing time. It is not necessary to carry this to any extreme degree, thereby effecting secondary decomposition upon the distillate yielded at 200° to 600° C. particularly.

Intumescence takes place at 350° to 400° C., depending on the nature of the coal, but with bad heating overrides the process, and causes expansion of the charge within the retort.

Conservation of the bye-products is assured by our system by the passage of the distillate transversely through the charge to a central offtake inserted bodily within the charge.

The low-temperature problem contains its key in the above arrangement, we contend, whereby equilibration of two factors—

heating the charge and withdrawing the distillate — hitherto allowed to oppose each other, is effected—viz., by quick treatment, by rapid medium heating along both external and internal methods, with conservation of the distillate yielded, by passing the same through the charge along the line of heat transmission, thereby usefully employing its sensible heat, and at the same time keeping down the temperature to which the distilled gases are exposed.

Naturally it is both necessary and advisable, amid the difficulties of low-temperature carbonization, to develop both methods of heating to the full. This is done in our system by a special arrangement of combustion flues of triangular shape with their base on the retort crust, together with another interposed set of convective flues for internal heating with their perforated apexes on the crust, the two types of flues alternating in a series along the retort side. Heating is confined to one side as previously mentioned, the offtake being directly opposite. The heating flues are constructed in two, three, or four stages along the retort height, according to the zoning requirements desired, and are made of highly conductive material, such as carborundum.

The above alternate flues allow of a transfusion of conductive heat into the convective heating gases, so that no loss of heating efficiency is necessarily involved in lowering of the heating temperature to about 900° C.

From the above remarks it will be seen that the Everard Davies system primarily attempts to embody fully the fundamental requirements of a satisfactory procedure, in accordance with the technical principles involved in this special method of carbonization.

It is true that, combined with this permanent stamp of essential requirements and features, the system lends itself to considerable modification of the following factors:

(1) The gaseous atmosphere, which can be varied at will by introduction of extraneous gases and steam with the flue gases into the charge.
(2) The chemical sensitivity of the gaseous atmosphere, which can be increased by electrolytic operation of the retorts.
(3) Temperature and pressure within the retort.

As a result, considerable elasticity is assured for realizing technical advantages in the way of increased yields of bye-products, or the synthesis of special products, over and above the *sine quâ non* of commercial throughput of good domestic fuel and liquid products.

Ignition Temperature of Coal.

In Bulletin No. 128 of the Engineering Experimental Station of the University of Illinois, at Urbana, Mr. Ray W. Arms describes investigations with regard to the ignition temperature of coal. As coal is raised in temperature by an outside source of heat, it produces more and more heat from its own combustion; but there is no point in this process where the change in rate of heating is sufficiently abrupt to be regarded as indicating a definite ignition temperature. The first purpose of the investigation, however, was to establish some definite point along the line of the process of heating which could be called the ignition temperature. In the attempt to locate such a temperature, heating curves were drawn, to show the rate at which the coal increased in temperature when assisted by an outside source of heat. After a study of these curves, the point at which the coal assumed a uniform glow was chosen as the most logical ignition temperature, not only because this point was found to be rather definite in the heating curve, but also because it could be checked in various types of apparatus by different means of temperature measurement and control, and by different operators. With this glow-point chosen as the ignition temperature, the method for the determination became comparatively simple. The sample of coal was heated gradually in a normal air supply until the glow appeared; the temperature of the coal itself being measured by means of a thermocouple. Among the samples tried were American bituminous coal, coke, anthracite, and lignite. The glow-points of several bituminous coals varied between 440° and 496° C. That of the lignite was 526° C.; of semi-bituminous coal, 528° C.; of the anthracite, 600° C.; and of the coke, 606° C. The amount of ash present in the coal has no apparent influence on the temperature of the glow-point. Moisture has a great deal to do with the rate at which the coal is heated-up to the point where it will burn; but, as the moisture is driven off before the glow-point is approached, the actual temperature of the glow-point can in no wise be affected by the quantity of moisture present. The glow-point for all sizes of coal is the same. Glowing of coal is a form of combustion which requires oxygen; but the actual temperature of the glow-point is independent of the quantity of oxygen supplied. The experiments appeared to indicate that the presence of pyrites does not alter the glow-point of the coal substance itself, but that its only effect is to add its heat of combustion to that of the coal.

Waverley Association of Gas Managers.—Thursday, June 8, at 11 a.m. is the date and time fixed for the annual meeting of the Association, at Galashiels. In forwarding this intimation, Mr. R. J. Philp (the Hon. Secretary) adds that "the Hawick Common Riding ceremonies begin on the evening of June 8, continuing until Saturday, June 10. Members intending to witness the interesting ceremonies connected with the Common Riding are advised to reserve hotel accommodation now."

THE MORTIMER PROCESS OF AUTOGENOUS WELDING.

The importance of acetylene welding to all branches of trade in which metal is employed cannot be gainsaid. During the past few years enormous strides have been made in autogenous welding; and to so high a state of perfection has it reached that there would appear no limit to the variety of apparatus amenable to its treatment, while in some industries it has completely changed the method of production.

The value of autogenous welding so far as gas-works are concerned should not be overlooked, as by its application broken or damaged apparatus which at one time was consigned to the scrap heap may be repaired and restored in a comparatively short space of time; thus obviating the delay and inconvenience occasioned by the long wait which is often necessary for the replacement by new parts. Articles that were previously scrapped or brazed, soldered, or riveted, or formed from the solid, are now autogenously welded. The application of the process is not confined to wrought iron and steel, but cast iron, copper, brass, &c., can just as satisfactorily be welded.

Acetylene welding, however, to be effective must be undertaken by highly skilled and trained operators having a wide experience of the properties of metals and the changes that they undergo when subjected to great heat. The Mortimer Welding Company, of Mortimer Market, Tottenham Court Road, W.C. (who may be regarded as specialists in this class of work), claim that there are few articles with which they are unable to deal by means of their special process. In a booklet issued by them the Mortimer welding system is fully explained, and many photographic illustrations are given of articles which experts had declared to be hopeless, but which the Company, by their special process, were able successfully to repair.

The Company claim that there is no job in metals which they cannot do, whether it be a broken crankshaft, damaged retort mouthpieces or coke discharge boxes, broken plug valve bodies, engine cases, cylinders, &c., and castings of any kind. Quite a large number of gas undertakings, we understand, because of the dependability of the Mortimer process, have availed themselves of their services. At the same time, by means of their portable electric welding plant, such articles as boilers, fire-boxes of steam-wagons, &c., can be satisfactorily repaired in position; thus saving the enormous expense usually entailed in dismantling. The Company also have a special process for the trueing of bent crankshafts; and they are able to guarantee an accuracy of 1-1000 in.

Abergele Gas Price.—It was reported to the Abergele Council last week that the Board of Trade had decided that, after examining the accounts of the local Gas Company for the past year, they could not issue an order for them to reduce the price of gas.

Accidental Death by Gas in a Convent.—Two Carmelite nuns gave evidence at an inquest at the Carmel Convent, Darlington, on Ellen Graham, who was the Prioress. Her room was found full of gas one morning; and the Prioress was discovered dead in bed. It was stated that the gas had escaped during the night from a defective rubber tube; and death was due to asphyxia caused by gas poisoning. A verdict of "Accidental death" was returned.

Reductions in the Midlands.—The Kidderminster Gas Company are intending to reduce the price of gas as from June by ½d. per therm. The present charge is 1s. 4d. per therm. The Kinver Gas Company announce a reduction of 5d. per 1000 c.ft. The Sedgley Urban District Council have decided to reduce the price of gas to all consumers by 3d. per 1000 c.ft. as from the Lady-Day quarter. The public lighting is to be reduced £1 per lamp per annum.

Slot-Meter Supplies at Redcar.—Mr. Neasham claimed, at a meeting of the Redcar Urban Council held recently, that, in equity, slot-meter consumers ought not to have to pay more for their supply than ordinary consumers. He said he had calculated that a slot-meter consumer who used 40,000 c.ft. a year paid something like two guineas more than the ordinary consumer for the same amount. Roughly, the gas cost him 1s. per 1000 c.ft. more than it did the ordinary consumer. A larger proportion of the supply was consumed by people with slot-meters; and they were probably the people who were hardest hit by trade depression. He did not think they ought to be charged more—particularly as they paid in advance, while other consumers were allowed three months' credit. The matter was referred to the Gas Committee.

Bahia Blanca Gas Company, Ltd.—In the report for the year 1921, which is to be submitted at the annual meeting to-day, the Directors state that the debit balance has been increased by £1474 to £44,331. As compared with the previous year, there is an improvement, due to the increased tariffs charged, to technical improvements which enabled labour costs to be reduced, and to cheaper fuel in the latter part of the period. The coals it was possible to purchase during the year were variable in quality; and repeated experiments had to be made in order to obtain the best working results. The materials for a new generator have been shipped to Bahia Blanca. The erection of the plant was commenced in February last; and it is hoped to have it working before the next Argentine winter commences. The wheat crop in the Bahia Blanca zone has been a failure; extremely low prices are being offered for live stock; and as a consequence business generally is bad. On the other hand, it is reported that oil refineries and storage tanks are being erected there; and when these are in going order, the prosperity of Bahia Blanca will not depend entirely on agriculture and cattle raising. Mainly because of the general conditions prevailing in Bahia Blanca, there was a decrease in gas sold as compared with the previous year.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Obtaining Blow Gases of Greater Heating Value.

SIR,—I have read with interest the thermal study by Mr. Harald Nielsen, and your comments thereon, in the "JOURNAL" of Feb. 1. Mr. Nielsen's idea of obtaining a blow gas of greater heating value by reducing to some extent the make of water gas, is one on which I have been working for some time, with, I am pleased to say, satisfactory results.

My plant for the manufacture of water gas in conjunction with coal gas (an abstract of the patent for which appeared in the "JOURNAL" for March 30, 1921) gave form to my idea. This plant is now in operation at the Auckland Gas-Works; and the blow gases which are continuously produced are conducted away in firebrick lined mains from the water-gas plant to the retort-settings, where they are burned, thereby reducing consumption of coke in the producers. The water gas is also continuously produced, and after being partially cooled is drawn in along with the coal gas at the inlet to the coal-gas condensers. It is intended to instal a similar plant in conjunction with our intermittent vertical retort settings; but in this case the water gas will be admitted hot to the lower ends of the vertical retorts.

The valves of the water-gas plant are automatically actuated by hydraulic power, a three or five minute run and a three or five minute blow alternating in each generator; and the plant has been running for a considerable time without a hitch. The blast pressure is from 2½ to 3 in. water gauge in the ash-pits; and the water-gas made is from 400,000 to 500,000 c.ft. per day. The steam supply to the water-gas plant is measured by a steam-meter. A recording calorgraph is in use on the inlet to the holders of the mixed gases. The shift foreman increases or diminishes the supply of steam as required in order to make, as near as may be, gas of 500 B.Th.U.

All blow gases are utilized; and the water gas made is of good quality. The sensible heat of the hot water gas is at present lost; but if this gas were passed hot as indicated above into vertical retorts, all except radiation and ash-pit losses would be recovered. I shall have pleasure in communicating to you results of tests at an early date. It seems to me that it is better to utilize the blow gases for the heating of the retort-settings than to complicate the water-gas plant with waste-heat boilers. There are also advantages in having both water gas and producer gas continuously produced, instead of intermittently.

JAMES LOWE, Engineer and Manager.

Auckland Gas Company, Ltd., Auckland, N.Z.
April 6, 1922.

[ENCLOSURE.]

Extract from the Report on the Coal-Gas and Electrical Supply Industries of the United Kingdom.

By Sir DUGALD CLERK, K.B.E., D.Sc., F.R.S., M.Inst.C.E.; Prof. ARTHUR SMITHELLS, C.M.G., F.R.S.; and Prof. JOHN COBB, C.B.E., B.Sc., F.I.C.

"More removed from current practice, but with no inherent impracticability, would be a method of carbonizing and gasifying which made the minimum of demand on external heating. For this purpose, carbonization and the water-gas process would be combined in the same apparatus, a continuous vertical gas retort so elaborated as to allow of the burning of a small portion of the coke to CO_2 during the blowing operation with air, using the hot gases for maintaining the external temperature of the retort and, afterwards, for heating the regenerators."

If the words "in the same apparatus" be deleted, this extract describes what has been attained by my plant for the manufacture of blue water gas in conjunction with coal gas, with this important difference in favour of my plant: It can be combined with any existing retort installation—horizontal, inclined, intermittent or continuous vertical—and is not confined to the continuous vertical system.

A copy of Mr. Lowe's letter was sent to Mr. Nielsen; and regarding it he writes as follows:

Sir,—It caused me real pleasure to read Mr. James Lowe's letter, and particularly so as he is realizing the possibilities of the proper utilizing of blow gas, and that he is not afraid to publish results of his test. This is really what is wanted. If the fundamental principle of a process is sound, publicity and constructive criticism of attained figures is all to the good, as in the long run so-called "secrets" will be found not secrets after all. In reality, there are very few new things under the sun, particularly in the gas industry. If I remember rightly, I was once told that Murdoch tried not only horizontal retorts, but also inclined and verticals.

As far back as 1899 a test was carried out by G. Lunge, of sulphuric acid and alkali fame (reported on in "Fischer's Jahresber d. Chem. Technol"), regarding a better class blow gas; and it was very successful. The firm of Julius Pintsch (who are perhaps the biggest continental water-gas plant makers) nearly fifteen years ago regularly used their cooled and scrubbed blow gas in gas-engines. The blow gas found to be required per B.H.P.-hour was about 110 c.ft. at 75 to 80 B.Th.U. at N.T. & P.; and the analysis closely resembled blast-furnace gas.

If I might offer a suggestion to Mr. Lowe, I would advise him to have his water-gas producer as close as possible to his vertical retorts if he desires to pass water gas straight into the lower end of the retort, as no heat drop can be allowed in the water gas. I am, however, afraid that the distribution of the hot water gas at the right temperature will not prove an easy matter, as not more than 20,000 c.ft. of water gas should be passed through each single retort if heated externally as well; and perhaps sticky coals and dense coke in the retort will present too great obstacles to the free passage of the water gas in a vertical retort. Of this I can, however, not say anything for certain, as I have only experience with a rotary retort with about 75 to 80 p.ct. of free space as far as internal heating is concerned.

I am certainly in agreement with Mr. Lowe when he suggests a two-stage operation. This is the only safe way, as with a one-stage operation—that is to say, one apparatus only—in reality two things happen: First of all carbonizing, and further down total or part gasification; and it is impossible to obtain any proper regulation of feed of material from one stage to another—a guarantee that only fully carbonized material enters the second or gasification stage, as otherwise there might be trouble with certain coals.

HARALD NIELSEN.

100, *Victoria Street, Westminster, S.W. 1,*
May 20, 1922.

The Venturi-Evase-Prat Stack.

SIR,—*Re* the above reference in your issue of May 10 (p. 327), our American cousins are famous for their brief and apt descriptions of operations, systems, appliances, &c. Why the change? I am preparing myself to see, for example, a well-known type of engine served-up with a treble-barrelled name, when the single word "Corliss" would be not only the correct but the best description. Whatever point Mr. Griepe wishes to make, there is certainly no justification for the title chosen. The "Prat chimney" (or stack) conveys the whole idea of the method described; and it is not new. For many years I have had the privilege of working in close co-operation with M. Louis Prat, the inventor of the system you describe, and which is known throughout the world as "Prat Draft," wherever mechanical draft is studied seriously.

Your readers may be interested to know that M. Louis Prat installed his first apparatus over 25 years ago, to deal with noxious gases. The apparatus consisted mainly of a fan injecting cold air through a nozzle into an *évasé* chimney. This plant may be still operating, as certainly it was for over 20 years at a Government powder factory. It was the solution of this problem, and M. Prat's discovery of the true theory of the low-pressure ejector, which resulted in the Prat draft as it exists to-day, and of which there are over 3000 installations at work. Many are operating on large boilers in the most important and modern central stations built during the past few years. The concrete chimney idea is not new. I have installed the Prat in this form in England for special work; and it was at work in similar form on the Continent long before.

As usual, success of the Prat system brought many imitations. Regarding the latter, and speaking for this country, I can say that, whatever the purchaser has thought, the apparatus has not been sold as a true Prat, but under some other name. In cases I have been asked to investigate, I have generally found that the installation consisted of an inefficient copy of M. Prat's earlier designs, and which anybody is at liberty to make in peace providing he (or, more important, the purchaser) is content with the result, and does not attempt to bring into disrepute a system which has earned a good name throughout the world.

I have before me a letter to hand from Canada. After describing the low efficiency of a "copy," the writer says they are now in the mood to buy experience. Anyone can design an inefficient ejector. Perhaps that throws some light on the "American opinions" quoted by you; and with regard to these generally, I am not surprised at some of the results, if the "formulæ for the design of Prat chimneys" which I have had brought to my notice have been acted upon.

To return to the title—the Prat chimney is, and always has been, *évasé;* and if in addition to this word we throw in the "Venturi," to make it (like a certain countryman's riddle) "more difficult," perhaps we will succeed—but not often.

S. UTTING, M.Inst.Mech.E.,
British Representative for the Prat Induced Draft Company.

Grosvenor Mansions, 82, Victoria Street, S.W. 1, May 18, 1922.

Gas Tragedy and Suggested Safety Device.—At the inquest on the body of Thomas Donaldson, a Montrose gas-fitter, who was asphyxiated while repairing a main-pipe leading to a meter, Mr. Alex. Gellatly (the gas-works foreman) said he did not see how deceased could have been overcome before getting a plug in. The Jury added to their formal verdict, as a rider, that in the case of new buildings the advisability of placing stopcocks on the branch from the main on the ground floor should be considered. Mr. D. M. M'Intyre (the Gas Manager) said that in some instances it would be safer, but in the majority of cases there would be more danger, because a householder might go out leaving a burner on, and if the supply were put off and on again in the interval the house would be full of gas. It was always dangerous to cut off gas, unless consumers were properly warned.

Death from Gas-Fumes.—An inquest was held last week respecting the death of William Walter Austin (36), of Wolverhampton, which occurred on May 11. Mr. Austin was a Finance Official of the local War Pensions Medical Board, and was employed in the huts which form the premises of the Board in Garrick Street. Evidence was given that in December last Mr. Austin complained of the effects of fumes from a gas radiator in his office; and subsequently Dr. Miller, a member of the Medical Board who attended him, considered that he was suffering from bronchitis which was caused by the fumes. Afterwards he suffered from bronchial pneumonia, became convalescent, but had a relapse, and died. Dr. Miller said Mr. Austin worked in a small office, about 8 ft. by 7 ft., and the primary cause of death was breathing the gas-fumes from the radiator without proper ventilation. Protests were made, and the Office of Works sent an official down. After a considerable time, the radiators were replaced by gas-fires, properly ventilated. No one with common sense, he said, would have put gas-radiators in small rooms like these, because they were only fit for a large hall. Dr. Bromley (Deputy Commissioner of Medical Services) said the Office of Works had sole control of, and were responsible for, the buildings and their maintenance. The Coroner (Mr. G. M. Martin) recorded a verdict that Mr. Austin died from breathing fumes from the gas-radiator under conditions in which he was employed.

REGISTER OF PATENTS.

Coal Distillation Products.—No. 154,938.

FLEISCHER, Dr. E., of Heidelberg, Germany.

No. 34,590; Dec. 7, 1920. Convention date, Dec. 8, 1916.

The recovery of the bye-products resulting from the coking of coal is a matter at present of such vital importance, the patentee remarks, as to be almost considered an economic duty. At the same time, in order to secure a thoroughly degassed solid coke, it is imperative that the coal be gradually exposed to a temperature of at least 900° C. It is the object of this invention to comply with these two widely differing demands, and in accordance with which the coal is coked by a direct internal heating.

The operation is carried out in a shaft furnace having the character of a gas-producer, which is charged with coal from above. In the upper section of the shaft the coal is subjected to only such a heat as to cause the separation of tar and ammonia. Thereupon, the degassed coal passes into the lower section of the furnace, which is traversed by a current of gas of over 900° C. By these means the last traces of gas contained in the coal are expelled therefrom and the product obtained is a solid coke. However, to render the process economical, due regard must be paid not only to a satisfactory yield of the bye-products, but likewise to a proportional yield of coke. For this reason, care must be taken that the hot gases introduced shall not consume any considerable quantity of solid carbon from the coal.

To this end, the gas in the lower part of the furnace must, as far as possible, be free from water vapour and carbonic acid, because at the temperature stated both these gases would consume the solid carbon. Hence, the gas must be a combustible producer gas raised to a temperature of over 900° C., and yet practically free from the gases mentioned. The action of water vapour and carbonic acid on the coal, however, very considerably decreases at temperatures below 800° C.; while the most suitable temperature for a good yield of tar and ammonia is between 600 and 700° C. For this reason, there does not exist the least objection to employing gases containing steam and carbonic acid at the temperature of distillation stated—in fact, by an increased percentage of steam the yield of ammonia is even augmented. It will therefore be found expedient so to arrange the furnace that the gas, heated to a temperature above 900° C., is introduced from below into the coal which has been already highly degassed. Then the gas is burned at an upper section of the furnace, by the injection of air with the addition of steam. At the same time, care must be taken that the gases burned will only possess a temperature of from 600 to 800° C., which may be done by a suitable regulation of the steam supply.

However, instead of introducing a combustible gas having a temperature of at least 900° C. from below, there could be introduced a gas of a lower temperature—especially if the combustible gas contains very little carbonic acid and water vapour—a small portion of which is burned by the addition of air so that by these means the temperature of 900° C. for the gas is attained. It is obvious that when introducing such a mixture, its percentage of carbonic acid or steam will affect the coke to a greater or less extent, so that this modification cannot be recommended for gases of low heating value unless they be free from carbonic acid and water vapour; but even in the case of this modified process, the actual degassing of the coal must be effected, as in the previous case, by the injection of air and steam at an upper section of the furnace.

Igniting and Controlling Gas-Burners.—No. 160,150.

PEERLESS BAKING EQUIPMENT CO., of Boston (Mass.), assignees of DENISON, N. B., of Providence (Rhode Island).

No. 26,342; Sept. 14, 1920. Convention date, March 12, 1920.

This invention relates particularly to gas burning apparatus for baking ovens and the like. Apparatus for lighting purposes has been proposed having rotary main and pilot valves; the main valve being rotated by an operating lever through a ratchet connection, and the pilot valve being simultaneously rotated by a lever connected to the operating lever. It has also been proposed to provide a pivoted lever adapted to actuate a reciprocable pilot valve and also a lever to rotate the main valve. In both of these constructions the operating lever after actuating the valves was returned to an initial position, leaving the main valve open but closing (or almost closing) the pilot valve. In addition it has been proposed to provide apparatus for lighting purposes in which the main valve was provided with a cam adapted to rotate therewith and cause a reciprocal pilot valve to open.

The object of the present invention is to provide apparatus of the kind mentioned above, having certain improved features of construction and operation rendering it particularly applicable for use with baking ovens and the like.

The patentees claim:

1. Gas burning apparatus of the kind referred to, in which the operating mechanism is connected to the valve of the main burner to move the same into various positions of adjustment variably to control the supply of gas, the mechanism operating the valve of the pilot burner by means of a rotary cam arranged to function when the main valve is opened at approximately three-quarters of its full extent.

2. Operating mechanism comprising an operating member connected to the main valve and an operating member for the pilot valve, characterized in this—that positive connections are provided between the operating members whereby they are simultaneously actuated, and a single operating handle is connected to one of the valve operating members. The rotary operating shaft has a cam adapted to engage the stem of a reciprocable pilot valve to open the same. A sprocket is connected to the main valve and by means of a sprocket chain to another sprocket on the pilot valve shaft.

Distilling Coal Tar.—No. 158,875.

AB-DER-HALDEN, C., of Nomexy (Vosges), France.

No. 2998; Jan. 24, 1921. Convention date: Feb. 9, 1920.

This specification relates to the process of, and apparatus for, the distillation of tar as referred to in the "JOURNAL" for May 17, pp. 387-8.

As the principal advantages secured, the patentee claims:

1. Economy and simplicity of construction. By reason of the low temperatures and pressures employed, the apparatus may be of a light construction.

2. Absolute continuity of operation.

3. Possibility of treating products of a defective quality. By reason of the removal of water (to which the product is submitted in the exchanger), and by reason of its division in the column, the formation of foam is prevented, which is liable to occur with the tars of gas-works.

4. The obtaining of a non-inflammable tar. The low temperature of the boiler and the considerable stirring caused by the current of steam provide for a uniform distribution of temperature throughout the entire mass and obviate an excess of heat which would produce a local coking action.

5. Constancy of the products obtained. The considerable mass of liquid passing through the apparatus constitutes a regulating system for the distilled products, and especially for the tar. The small variations of output which may be accidentally produced can have but a slight influence upon the composition of the contents of the apparatus. As an immediate consequence of this advantage, it becomes possible to treat a small hourly output of liquids for which the variations of flow have a more considerable amplitude.

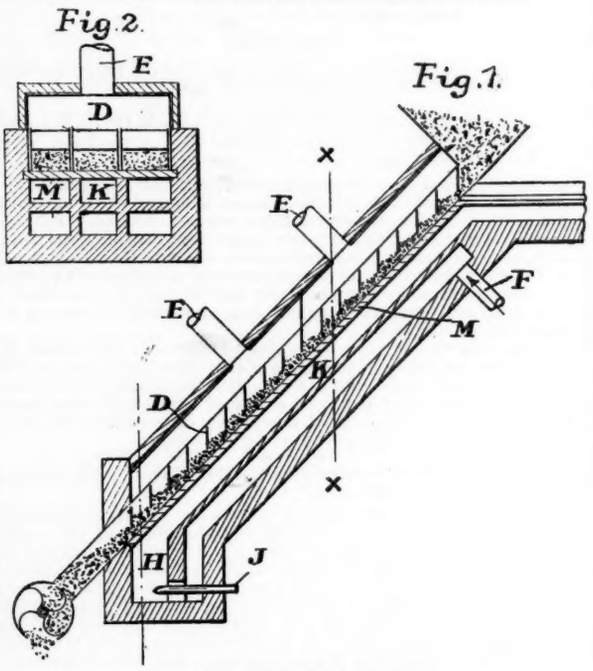
6. Purity of the products obtained. By reason of the low temperature of distillation, and as a consequence of the system of condensation, the distilled products are free from tarry substances, and are clearly classified. Thus in the distillation of coal tar, the naphthalene is localized in the middle oils, and is only seen in an insignificant quantity in the heavy and the light oils.

Carbonizing Coal and the Like.—No. 177,588.

STANSFIELD, E., of Edmonton, Alberta.

No. 36,088; Dec. 23, 1920.

This invention relates to a process and apparatus for carbonizing materials such as coal, lignite, peat, &c. It may be carried out in one way in apparatus as illustrated in fig. 1, a vertical section of a furnace and retort; and fig. 2, a vertical cross section on the line X—X.



Stansfield's Carbonizing Apparatus.

The inclined floor M is made of suitable fire-resisting material of good thermal conductivity. Carborundum slabs are preferred for high temperatures, and cast-iron plates for lower temperatures. This floor is inclined at an angle greater than the angle of repose of material. It is heated from below by the gas or oil burner J in the combustion chamber H at the bottom of the flue K. The air for the burner enters at F, and is preheated in the flue G. The retort or gas chamber may be divided into separate compartments with separate gas outlets E E. At the top of the retort is a feed hopper; and at the bottom is a chute C from which the material is withdrawn by suitable means.

Baffles D are arranged to cross the retort vertically R with a clearance between them and the floor. By varying the clearance and the frequency of the baffles it is possible to adjust the thickness of the layer of charge to meet varying conditions and to treat materials of different composition and quality. By dividing the floor into two or more parallel channels, as shown in fig. 2, it is possible to localize any slip in the charge; thereby ensuring a more equalized evolution of gas in the retort.

Protective Progressive Distillation.—Nos. 177,556 and 177,559.

LEWIS, G. P., of Westminster, S.W. 1.

No. 27,910 of Oct. 1, 1920, and No. 30,537 of Oct. 28, 1920.

By these two specifications, the patentee claims a combined retort and generator, forming part of a plant for the distillation and gasification of carbonaceous matter and recovery of ammonia in which, in order that distillation shall be completely effected in the retort, the temperature of the latter is progressively raised from the top downwards to a maximum value of about 1300° C. by flues surrounding the retort and traversed by the products of combustion of some portion of the producer gas generated in the generator or of the gases from the recovery plant after removal of the ammonia and hydrocarbons. The secondary air is heated by the waste gases from the retort flues, and superheated steam is supplied to the generator and retorts by a boiler and superheater. The lower ends of the vertically arranged retorts communicate by funnel-shaped chambers with the upper end of the generator; the coke passing through the chambers without the admission of air. The retorts are separated from, and placed by the side of, the generator, to the hopper chamber of which the coke from the retorts is led by a conveyor. Boric compounds are added to the raw fuel.

Improvements in Apparatus for the Manufacture of Gas.—No. 178,208.

BROOKE, R. M., and WHITWORTH, W., both of Halifax.

No. 1984; Jan. 13, 1921.

This invention relates to horizontal, or substantially horizontal, retorts for use in connection with the manufacture of gas, and to that type of retort which has a duct or channel extending along its under side and containing a steam-pipe, the steam from which becomes superheated before entering the retort. In apparatus of this class it has been proposed to form perforations in the bottom of the retort at intervals throughout its length for the admission of the superheated steam. According to this invention instead of the perforations being formed at intervals throughout the length of the retort, they are in the case of a "back-ended" retort formed in the back end, and in the case of a retort of the "through" type they are situated as near to the rear end thereof as is practicable. By this construction, when the retort has been fully charged for a portion of its length, superheated steam or hot air can be drawn or blown through the full body of the charge.

The patentees claim apparatus for manufacturing gas wherein the passages in the superheating flue or flues are arranged to admit hot air or superheated steam to or near the back end only of the retort for the purpose specified.

Apparatus for the Medium and Low Temperature Distillation of Carbonaceous Materials. No. 178,537.

NIELSEN, H., of Muswell Hill, N. 10.

No. 2120; Jan. 14, 1921.

According to this invention, a retort is employed constituted by two or more tubular members arranged round one another concentrically, the material to be roasted or distilled being caused to pass continuously from one end to the other end of the retort between the two tubular members, and then conveyed in the opposite direction along the inside of the other tubular member; the distillation or carbonization being effected by causing the heating medium to enter the retort through the innermost tubular member, through which it passes in direct contact with, and in the opposite direction to the travel of, the material under treatment. Thence it passes into the outer tubular member, from which it is led away, together with the products of distillation (for example, by means of suitable offtake pipes or ducts), to a collector, which in turn is connected up to a stationary dust separator and to a hydraulic main by means of a stuffing-box. By this arrangement it is claimed that the usual drawbacks associated with low-temperature retorts are dispensed with, and distillation or carbonizing can be carried on at a rate which has heretofore not been possible. The heating medium is preferably constituted by producer gas withdrawn directly and without ignition or combustion from an adjacent producer; and the so-called sensible or mechanical heat of the unignited producer gas is employed in known manner to effect carbonization by being brought into direct contact with the material in the retort.

One embodiment of the invention is illustrated by fig. 1, a longitudinal section of the improved retort, and fig. 2, a cross section of part thereof. A is a hopper for the carbonaceous material to be treated, C C are charging doors, D is the outer shell of the retort, E E are gusset plates firmly fixed to D and supporting the inner retort tube. F F are fixed shovels or buckets for charging the inner tube with carbonaceous material from an annular chamber formed between the outer shell D of the retort and the inner tube. G G are transversal shelves or plates of any well-known form located within the tube. H is a stuffing-box through which the inlet pipe I for the heating medium enters. The retort tube is shown lined with firebrick at the end adjacent to the inlet pipe I, the latter being preferably in communication with a gas producer (not shown). J is the collector for the carbonized material or residuum from the destructive distillation. L L are the gas offtakes, and M M are offtake pipes which are connected to the rotating gas collecting pipe N, which, through a stuffing-box, enters a stationary dust chamber O. P P are runner bands located round the retort, which runs on rollers Q Q.

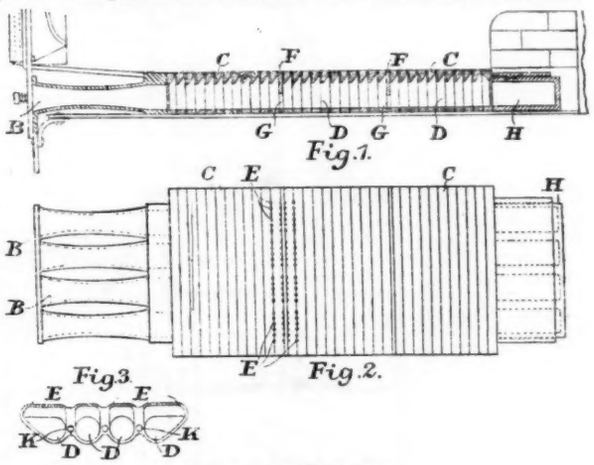
Owing to this construction and arrangement of the parts of the retort, the heat usually lost by radiation from the hottest zone—that is to say, the inner tubular member—is conserved and made use of in the outer annulus by direct conduction to the carbonaceous material contained within the same. As, therefore, the outer surface of the retort (where the real heat loss by radiation to the atmosphere takes place) has only a very moderate temperature, the heat losses within the retort itself are very small, and the outer tubular member serves in fact as a heat jacket for the inner tubular member. Furthermore, it will readily be understood that by employing a retort containing an inner tubular member, the over-all length of the retort is only one-half of that of a single retort with the same length of travel of the carbonaceous material; and consequently the radiation surface through which heat losses can occur is greatly diminished.

Furnace Grates.—No. 178,605.

WILTON, T. O., and the CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE COMPANY, LTD., both of Hendon, N.W. 1.

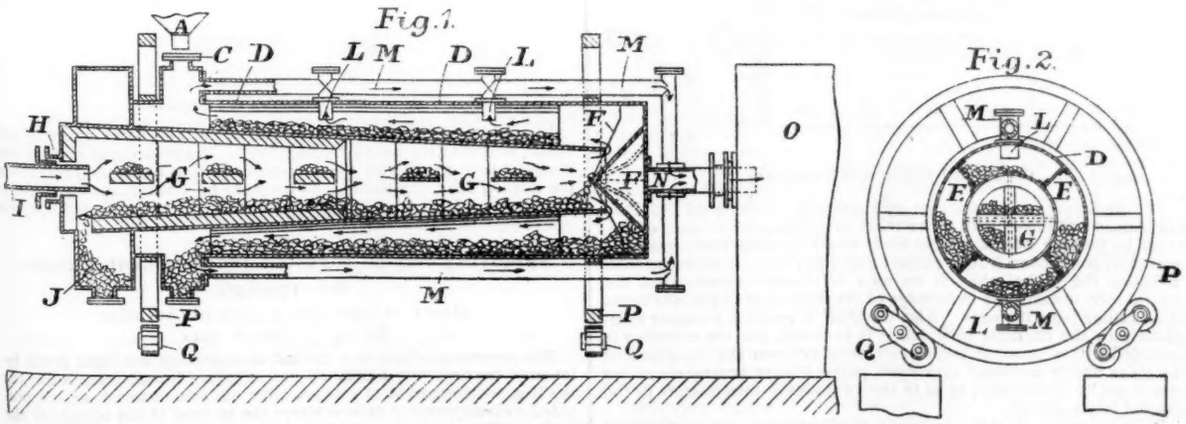
No. 4201; Feb. 4, 1921.

The object of this invention is to provide an improved furnace grate with means for distributing the supply of air and steam as may be required. The grate is characterized in that the passages through the



Wilton's Improved Grate.

firebars are suitably choked by placing baffle plates provided with suitably restricted apertures at suitable points along the grate, as may be



Nielsen's Rotary Retort.

required, so as to distribute the supply of air and steam as may be required.

Fig. 1 is a longitudinal section of one form of grate made in accordance with the invention; fig. 2 is a plan of fig. 1; and fig. 3 is an elevation of one form of firebar. B B are tubes adapted to receive the nozzles of the blowers, C C are firebars, D D are apertures in the firebars adapted to form passages in line with the tubes B B, when the bars are placed side by side, E E are grooves to convey air and steam from the passages to the surface of the grate, F F are plates provided with holes G G which are smaller than the apertures in the firebars and so choke the passages. H is the bridge, which may be hollow, through which the blast may pass to heat the blast and cool the bridge. Air and steam pass along the passages formed by the apertures D D and through the grooves E E to the surface of the grate; the perforated plates F restricting the flow of air from one part of the passage to the next, so that by altering the position of the plates and the size of the holes G, the supply of steam and air can be permanently adjusted to suit any requirement. The firebars are clamped together by rods which pass through the holes K K, springs being provided on the rods to allow for expansion and contraction due to variation of temperature. Any bar can be removed by slackening the nuts on the rods and withdrawing the latter.

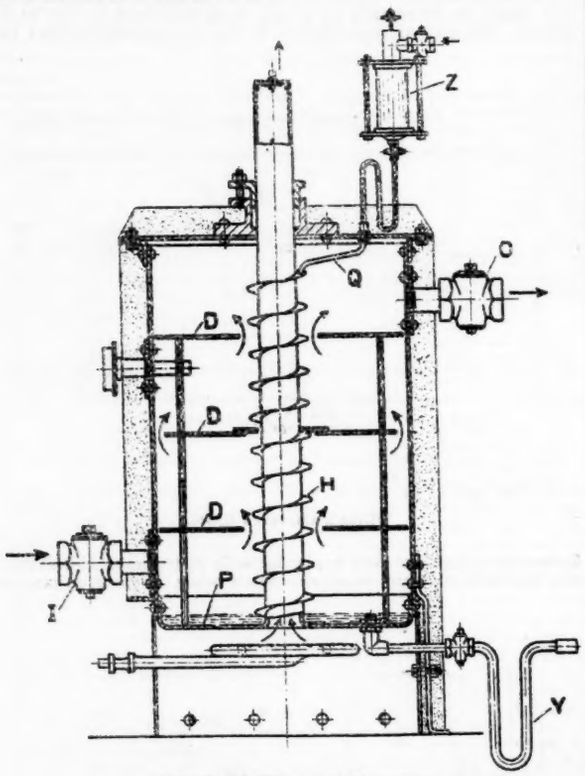
The patentees are aware that it has been proposed to use unperforated baffle plates (or blank firebars) located so as to divide the passage constituted by the apertures in the firebars into several distinct chambers, each of which is supplied by a distinct blower or steam jet, for the purpose of distributing the air and steam supply to various parts of the grate, and they make no claim to this use and kind of baffle plate.

Apparatus for Mixing Vapours with Coal Gas. No. 178,734.

Cripps, F. S., of Horsham, and Milbourne, R. J., of Lilleshall Old Hall, Shropshire.

No. 13,116; May 9, 1921.

This invention relates to apparatus for evaporating paraffin or other liquids and mixing the vapour produced with coal gas, being intended primarily for the prevention of the deposition of naphthalene in, or its removal from, gas mains and pipes. It consists of an iron or steel vessel having a central flue-pipe around and to which a spiral shelf, preferably of copper, is attached. The vessel is heated from below by an ordinary gas-ring in an enclosed chamber, the products of combustion passing away by the flue.



Cripps' and Milbourne's Vaporizer.

The patentees are aware that in apparatus in which oil has been evaporated and mixed with air or other gases, the oil has been evaporated by passage over a helical shelf which in some cases has been heated by conduction from a central flue-pipe; but, according to their invention the helical shelf is inclined or turned upwards from the central tube towards the outer edge of the shelf so as to prevent drops of oil falling from the edge. Also the shelf is small in diameter compared with the chamber in which it is enclosed, and the chamber is provided with a series of baffles extending between the flue-pipe and the sides and is provided with open passage ways alternately at the centre and circumference, so as to secure thorough intermixture of the gas and vaporized oil.

With reference to the accompanying illustration, the operation is as follows: By opening the cock of the sight feed Z, the liquid to be vaporized is passed through the top plate by means of the pipe Q, and delivered on the metal spiral shelf H. This pipe is trapped outside to prevent gas entering the sight feed and clouding the glass. The oil then flows gently down the heated shelf H, from which it is vaporized in its downward course, and from the hot bottom-plate P, to which the spiral shelf extends. Any surplus oil, beyond what is necessary, passes away by the overflow pipe Y, and is returned to the tank from which the supply is taken. The oil is prevented from dripping off the outer edge of the spiral shelf by the latter being inclined towards the flue-pipe.

The oil is evaporated from open surfaces only, to avoid any possibility of stoppage of its flow by corrosion or deposit, as would be the case with a heated closed pipe. Further, no oil is allowed to drop free from contact with the heated surfaces, to avoid the possibility of its being carried forward by the gas without being properly vaporized and incorporated with the gas. The coal gas is admitted at I in the lower part of the vessel and passes upwards following a zigzag course to the top, being directed inwards and outwards, to and from the centre alternately, by means of the baffle plates D and as shown by the arrows. During its upward course, it is intimately incorporated with the paraffin or other vapour arising from the hot surfaces before leaving by the outlet O to be incorporated with the main body of the gas.

Gas-Fires.—No. 177,446.

Thomson, J. B., of Ainger Road, N.W. 3, and Allkins, E. J., of East Sheen, S.W. 4.

No. 17,832; June 30, 1921.

This invention consists in an improved portable gas-fire stove so constructed that it can be removably fitted into existing barless fireplace openings.

It comprises a row of upright fireclay or like tubular elements arranged with their lower extremities end-on to a Bunsen burner; the upper ends of the elements being surmounted by a hollow horizontal crown piece of Λ-shape perforated on its outer face. A fireclay or like quarry or back, carrying a metal reflector, is disposed in rear of the row of elements; all the above-mentioned parts being carried by the bottom member of the fireplace grate.

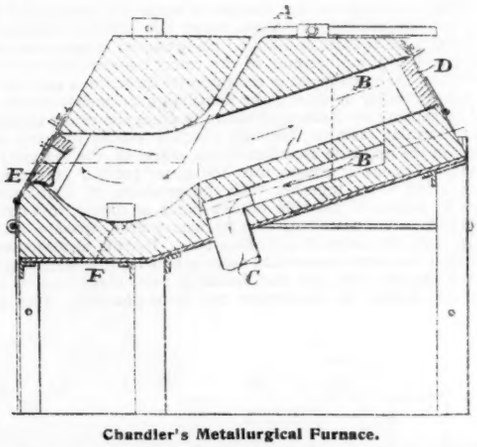
Gas-Fired Metallurgical Furnaces.—No. 178,722.

South Metropolitan Gas Company, and Chandler, D., both of Old Kent Road, S.E. 15.

No. 11,699; April 22, 1921.

This invention relates to furnaces of the reverberatory type, and is especially applicable for use in treating metals.

The illustration is a longitudinal sectional elevation. The furnace comprises a sloping floor which leads to a well hearth. Passing through the roof are burners A supplied under pressure with air and fuel such as gas, the burners being arranged at a tangent to the rear portion of the hearth. Near the rear end of the furnace are side flues B, communicating with flues arranged beneath the floor and leading to a flue outlet C which is situated short of the hearth, in order that the latter may be solid. At the rear of the furnace is a door D for admitting the material to be treated, and at the front of the furnace is a skimming door E provided with a sight window. The hearth is provided with a spout F, the passage leading to which can be closed by a loose brick.



Chandler's Metallurgical Furnace.

In operation, the material to be treated, such as metal ingots or ash metal, is spread out on the sloping floor. The products of combustion circulate over any molten metal therein and pass along the roof above the sloping floor, pre-heating the metal to be treated, thence through the side flues B, thus still further pre-heating the material, and through the flue outlet as indicated by the arrows.

Supplying Air to Inverted Incandescent Lamps. No. 176,856.

Hurst, H., and Ives, J., both of Droylsden.

No. 34,352; Dec. 6, 1920.

This invention relates to a method of improving the light given by inverted burners with a reduced gas supply. It consists of a disc, or the like, which may be of glass or other suitable material, and is provided with supports to raise it above the air inlet at the bottom of the globe, sufficient to allow for the supply of air necessary for the flame to enter the globe.

Rabbles for Low-Temperature Distillation Purposes. No. 178,504.

BARRS, E., of Gray's Inn, W.C. 1.

No. 35,753; Dec. 20, 1920.

This invention is for improvements in rabbles for low-temperature coal distillation or other purposes where a like movement of the material is required. It relates to the type of rabble comprising a grid or a plurality of grids disposed one behind the other on a supporting frame, which is caused to travel in a path which is both upwardly and forwardly directed near the limit of its forward movement to lift it out of the material prior to the return movement.

It has previously been proposed to cause a rabble of this type to ride up a tilting trip-piece near the end of its travel, so that at the end of its stroke it would fall over the trip-piece and could return under it. It has also been proposed to give a similar movement to a rabble by reciprocating it by means of crank-pins working in slots and putting blocks in the slots so that during the movement of the crank-pins in the upper part of their circular paths the rabble would be lifted.

According to the present invention, a rabble or like apparatus of the type described is carried by laterally disposed rollers running upon upper and lower tracks connected by ramps at points traversed by the rollers towards the end of the forward movement. The guides therefor are provided with means whereby the rollers can pass from the tops of the ramps to the upper tracks during backward travel, and with means whereby the rollers can pass at the end of their rearward movement to the lower tracks. The means for supporting the rollers during their passage from the tops of the ramps to the upper tracks may take the form of shunt-plates moved into position (for example lengthwise) to bridge the gaps in the upper tracks through which the rollers rise in ascending the ramps and moved back to clear the gaps prior to the next traversing of the ramps by the rollers.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 17.]

Nos. 12,881 to 13,572.

AIRD, K.—"Gas, &c., cocks or taps." No. 13,191.
ATHEY, F.—"Rotary gas or explosive-vapour motors." No. 13,304.
ATKINSON, A. E. & T. F.—"Pipe connections." No. 13,564.
BASTERRA, M —"Gas-burners." No. 13,399.
BENTALL, E. E.—"Producer-gas plant." No. 13,174.
BINGHAM, G. C.—See Bentall, E. E. No. 13,174.
CHADWICK, R.—"Socket and spigot joints for tubes, &c. No. 12,900.
DUGDILL, J.—"Movable supports for electric light, gas, &c." Nos. 13,394, 13,525.
GALBRAITH, W. L.—"Purification of gases from hydrogen cyanide." No. 13,083.
GOSLIN AND SON, S. B.—"Gas cooking and heating stove." No. 13,023.
HAWKINS, L.—See Goslin and Son, S. B. No. 13,023.
ILLINGWORTH, S. R.—"Plant for carbonization of coal." No. 13,359.
KOPPERS, H.—"Coking and carbonizing." No. 13,046.
KUGLER, G.—"Gas-meters." No. 13,118.
LYNCH, H. L.—See Basterra, M. No. 13,399.
OLDFIELD, G. H.—"Gas-cleaning apparatus." No. 13,252.
SHAW, R.—"Dehydrating and/or partially distilling tars, mineral oils, &c." No. 13,353.
TAPLAY, J. G.—See Galbraith, W. L. No. 13,083.
TAYLOR, L.—See Oldfield, G. H. No. 13,252.
TOOLEY, G. W.—"Settings of vertical retorts for distillation of carbonaceous materials." No. 13,221.
WEST'S GAS IMPROVEMENT COMPANY, LTD.—See Tooley, G. W. No. 13,221.
WORTLEY, G. W.—See Aird, K. No. 13,191.
YOUNG, G.—"Process for obtaining oils of low sulphur content from shales and non-caking coals." No. 13,034.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Blackburn Corporation Bill: Read the third time, with the amendments, passed, and returned to the Commons.
Croydon Gas Bill: Reported, with amendments.
Ramsgate Corporation Bill: Read the third time, and passed; sent to the Commons.
Sheffield Gas Bill: Reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

Bolton Corporation Bill: Read a second time, and committed.
Neath Corporation Bill: Reported, with amendments, from the Local Legislation Committee.
Ramsgate Corporation Bill: Read the first time, and referred to the Examiners.

A Committee, consisting of the Chairman of Ways and Means, the Deputy-Chairman, Commander Bellairs, Mr. Hayward, and Sir Ernest Moon, has been appointed to consider the Windsor Gas Bill, to meet to-day (Wednesday).

Chester Gas Bill.

The opposition to this Bill having been withdrawn, the Orders made in regard to it were discharged, and the Bill committed.

Gas Regulation Act.

A copy was presented of a draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Act on the application of the Aylesbury Gas Company.

Imported Gas-Mantles and Taxation.

Major BARNES asked the President of the Board of Trade whether he had ordered another inquiry to consider the advisability of placing a duty under Part II. of the Safeguarding of Industries Act on imported gas-mantles; if so, whether he was aware that an inquiry under Part I. of the Act had already been held; that this inquiry extended over several months and involved an expenditure of several thousands of pounds; and whether, seeing that these continuous inquiries were a serious embarrassment to trade, he would allow a reasonable time to elapse before a second inquiry in respect of the same article.

Mr. BALDWIN replied that a complaint relating to gas-mantles manufactured in Germany had been referred to a Committee under Part II. of the Act. The answer to the second and third parts of the question was in the affirmative. With regard to the last part of the question, it must be borne in mind that the inquiries under the Act were made on the application of the trade interests concerned, and that the two inquiries to which reference had been made related to entirely different questions—in the one case, the interpretation of the Schedule of key industries, and, in the second case, to alleged dumping due to depreciation of foreign currency.

STRETFORD AND DISTRICT GAS BOARD BILL.

Objections to Locus Standi.

Objections to the *locus standi* of a number of petitioners against this Bill were raised by the promoters on Wednesday last before the Court of Referees of the House of Commons. The Court consisted of Mr. JAMES HOPE (Deputy Speaker), Sir EDWIN CORNWALL, Sir JAMES GREIG, Mr. ERNEST MOON, Mr. HOLMAN GREGORY, and Col. F. S. JACKSON. The petitions concerned were those of owners and occupiers of property and consumers of gas in the Urban District of Sale; the Manchester Ship Canal Company and others; companies and firms owning works and property in Trafford Park; and owners and occupiers of property and consumers of gas in the Urban District of Urmston.

Mr. ROWAND HARKER, who appeared for the owners and occupiers in property and consumers of gas in both Sale and Urmston, briefly outlined to the Court the provisions of the Bill, which were to constitute and incorporate a Joint Board consisting of representatives of the Urban District Councils of Stretford, Ashton-upon-Mersey, and Sale, and the Rural District Councils of Barton-upon-Irwell and Bucklow. The Board were to acquire from the Manchester Corporation the undertaking of the Stretford Gas Company, which the Corporation had purchased under the provisions of the Manchester Corporation (General Powers) Act, 1921, in which it was provided that if these local authorities promoted a Bill in the next session of Parliament for the acquisition of the Stretford undertaking, the Manchester Corporation should not oppose. [The provisions of the present Bill were outlined in the "JOURNAL" for Jan. 18 (p. 152), and the proceedings before the Committee of the House of Lords were reported in the "JOURNAL" for April 5, p. 40.] The limits of supply of the Stretford Gas Company included, *inter alia*, the Urban District of Sale. The three material clauses in the Bill, so far as the question of *locus* was concerned, were clause 43, the substance of which was that it fixed the maximum price at which gas could be supplied by the Joint Board at 5s. per 1000 c.ft., subject to subsequent application to the Board of Trade for revision if circumstances justified that course; clause 50, which gave the usual powers to supply, either by sale or on hire, gas fittings and meters at a price to be fixed by the Board; and clause 81, the substance of which was that, in the event of there being a deficiency by the gas undertaking to be acquired by the Joint Board, such deficiency was to be made up by the levy of a rate upon ratepayers in occupation of properties in the areas of the constituent authorities. That clause was very material from the point of view of the petitioners in Sale, although not from that of those in Urmston. The petitioners in Sale were ratepayers there, and Sale was one of the proposed constituent authorities on the Joint Board. Urmston was not a constituent authority.

With regard to the price of gas, Counsel said that under the provisions of the Manchester Corporation's Act of last year, the Corporation, having become suppliers of gas over the whole of the area previously supplied by the Stretford Gas Company, were placed under an obligation to supply all consumers within that district with gas at the same price as that at which it was supplied to consumers within the City of Manchester, and they were supplying at the present time at a price considerably below the maximum proposed in the present Bill. Originally the Bill was promoted by all the five local authorities already mentioned, and also the Urban District Council of Urmston. That was in November of last year. The deposit of the Bill created very great public interest in the districts, and the necessary public meetings under the Borough Funds Act were called. In Sale, 1396 persons voted against the proposals, and 1180 in favour—a majority of 216 against further participation in the promotion of the Bill by the Urban District Council of Sale. Shortly afterwards, a deputation of ratepayers in the district waited upon a meeting of the Sale Urban District Council. The Chairman of the Council read to this deputation a resolution of the Council that instructions be given to their Parliamentary Agents to withdraw from the support of the Bill. This was how the petitioners understood it. The Sale Council ceased to be promoters of the Bill in fact; and when the measure was before the House of Lords, the Urban District Council of Sale were left in as a constituent body of the Joint Board, in spite of the fact that so many

had voted against the proposal at the statutory poll. They considered that, so far as they were concerned, the whole matter was at an end.

Mr. Moon asked whether Mr. Harker's clients in Sale had petitioned in the House of Lords.

Mr. Harker said they did not, because they thought that, having rejected the proposal at the poll, and having had the assurance of the Chairman of the Council that the Parliamentary Agents had been instructed to withdraw support from the Bill, there was no need to petition, and that the Urban District of Sale disappeared from the proceedings altogether. When the Bill was before the House of Lords Committee, however, they discovered that Sale had been left in as a constituent authority, which carried with it the liability of becoming parties to a deficiency rate.

The Chairman asked what had been done by the Sale Council since the poll.

Mr. Harker said his instructions were that they had taken no steps whatever.

The Chairman: But they do remain as promoters?

Mr. Harker said that was the curious position. The Bill was now being promoted by the Urban District Councils of Stretford and Ashton-upon-Mersey, and the Rural District Councils of Barton-upon-Irwell and Bucklow. They were the technical promoters. The position was that, as the Bill passed the House of Lords, the Urban District Council of Sale had been left in as a constituent authority of the Joint Board, as well as the other authorities.

The Chairman: They will be a constituent authority if the Bill passes in its present form, and liable to a deficiency rate?

Mr. Harker: They will be.

Mr. Holman Gregory asked whether it had been mentioned in the other House that the Urban District Council of Sale were not promoters.

Mr. Harker said he could not answer that accurately, because he was, on that occasion, only concerned with the ratepayers in Urmston. When the Bill was before the House of Lords at first, Urmston was also left in; but he believed it was struck out on the very morning the Bill came before the Committee.

Mr. Holman Gregory said he took it the facts mentioned by Mr. Harker were not before the House of Lords.

Mr. Harker replied in the negative. Continuing, he said he claimed a *locus*, first, on the ground that petitioners were ratepayers, because if there were a deficiency they would have to pay; secondly, as consumers they were perfectly content with the present position. The price of gas, since the supply had been taken over by the Manchester Corporation, had been reduced on two occasions, and to-day they were paying 3s. 10d. per 1000 c.ft., instead of 5s., which was the maximum the Joint Board sought powers to charge in the Bill. With regard to Urmston, the Local Authority there did not remain a constituent authority, and, therefore, his Urmston clients could not be made liable for any deficiency, although remaining within the limits of supply. They asked for a *locus* as consumers.

Sir Lynden Macassey, K.C., for the promoters, agreed with regard to the provisions of section 43 of the Manchester Corporation's Act, which placed the Corporation under an obligation to transfer the Stretford undertaking if the Councils mentioned, or any two or more of such Councils, promoted a Bill for the constitution of a Joint Board for the purpose of acquiring it. From the very first moment that Manchester took over the undertaking, it was subject to the provisions of that section. Coming to the promotion of the present Bill, it was quite true that the petition for the Bill was originally signed by all six local authorities. In Sale, the poll taken under the provision of the Borough Funds Act was adverse to the promotion of the Bill, and, as a result, the Sale Urban District Council expressed their desire to be removed as a constituent authority. But after that fact became public, a petition signed by 5035 local government ratepayers, out of a total of 7327, was presented to the Urban District Council of Sale, and he (Sir Lynden) submitted that those facts were brought to the attention of the House of Lords Committee. He himself had stated to the Committee that Urmston had been deleted from the Bill, and were no longer promoters. In the case of Sale, however, after the poll had been taken the people there had apparently awakened to the exact position. What happened was that the Manchester Corporation had flooded the district with propaganda. The petition of the ratepayers in Sale urged the Council to become a constituent authority of the Joint Board. Therefore, the Sale Urban District Council remained as a joint promoter of the Bill. In the present petition it was stated that the petitioners acted as an Executive Committee on behalf of the consumers. He submitted, however, that, in fact, the petitioners were not appointed as an Executive Committee, by resolution, to act for or on behalf of the consumers of gas. The consumers represented by the petition consumed 1-25th of 1 p.ct. of the total gas supplied in the whole area, and 1-5th of 1 p.ct. of that supplied in Sale. There were six signatories out of a total number of 1300 consumers; and he submitted that the Court would not hold that such an insignificant number of gas consumers were entitled to come forward and be heard, either in their own capacity or as representing gas consumers.

The Court then conferred, and

The Chairman announced that the *locus* would be granted.

Mr. Harker asked whether that also applied to the consumers in Urmston.

Sir Lynden Macassey pointed to the distinction between the two. Urmston was not a constituent authority; and the petitioners were not in any way liable to any burden as ratepayers.

The Chairman announced that the Court admitted the *locus* in the Urmston case.

The petition of companies and firms owning works and property in Trafford Park was next dealt with.

Mr. Brown (Messrs. Dyson, Bell, & Co., Parliamentary Agents) said that the petition was one by a considerable number of companies consuming gas in Trafford Park, which was in the urban district of Stretford. It had come to the notice of the Solicitor to his clients that certain of those clients had decided to withdraw from the petition; but he had not been informed of the reasons. On the previous day (May 16), he had received a letter from the Parliamentary Agents for the promoters of the Bill to the effect that they had received a document comprising a request on the part of all the signatories to the petition to withdraw all their names from it, and that they were lodging that request at the Private Bill Office. He had concluded from this that the promoters were under the impression that that petition was no longer a petition on the file. He was not prepared to admit, however, that the petition was withdrawn.

The Chairman said he understood that there was a question as to what would become of the petition in the Private Bill Office. He pointed out that if the petitioners did not enter an appearance, presumably the petition lapsed. He did not see what *locus* they had.

Mr. Moon pointed out that, supposing the petition were still on the file, Mr. Brown could do nothing without instructions.

The Chairman referred to "Committee Office Procedure," which stated that should any petitioner not put in an appearance, his *locus standi* was disallowed. Therefore, the matter could not be proceeded with further.

Mr. W. E. Tyldesley Jones, K.C. (for the Manchester Ship Canal Company and others), said that the petitioners included the London and North-Western Railway Company, the Anglo-American Oil Company, Shellmex, Ltd., and many other large companies. They did not petition as consumers of gas, but as ratepayers. Objection had been taken to the petition on the ground that the petitioners could not appear as ratepayers against a Bill promoted by their local authorities. The petition was that he was appearing for ratepayers in a certain area which was under the jurisdiction of the local authorities promoting the Bill. Four local authorities were promoting a Bill dealing with the whole area of the six districts, which imposed a liability on the rates of the whole area with the exception of one district. The Bill, as originally deposited, proposed to impose a liability on the ratepayers in the whole area. In some districts the Bill was approved, and in others rejected, by the ratepayers.

The Chairman asked whether Mr. Jones' clients were scattered about the whole area.

Mr. Jones said he had clients in practically every district. The Manchester Ship Canal Company were in Sale. Two of the districts out of the six had decided against the Bill; and those two included Sale. But the Bill sought to impose a liability on the Sale ratepayers, of whom the Canal Company was one. It was said that he could not oppose the Bill because he was represented by a local authority. He contended, however, that he was not represented by the local authority as regards Sale, because Sale were doing nothing. As regards Stretford, he was entitled to a *locus* there, because the Stretford Urban District Council put before their ratepayers at the statutory meeting a different Bill from that which was before the Court at the present time. The original Bill sought to impose a liability on the ratepayers of the whole district, a large part of which had now been cut out, and the Bill would impose a greater burden on those authorities remaining in. He quoted a precedent—that of the Bristol Corporation Tramways Bill, in 1914—in which petitioners claimed to be heard as ratepayers. One thing was clear—that where the local authority did not petition against a Bill which affected local interests which otherwise that local authority could represent, those affected were entitled to present a separate petition.

The Chairman: That applies to Sale and Urmston only.

Mr. Jones agreed. Where the local authorities were doing nothing, he was entitled to a *locus*; and in those districts where the local authorities were promoting a Bill he also claimed a *locus*, because the Bill, as it stood, had never been presented to the meeting of ratepayers in those districts, and had not been approved by them.

Details with regard to the proportion of rateable value of the petitioners' property were handed to the Court by the promoters.

Sir Lynden Macassey said that the rateable value of the Canal Company's property in Sale was £245. They were not in Urmston at all. All the other petitioners were in Stretford, with the exception of three, who were in Barton-upon-Irwell. He submitted that they were not entitled to be heard as ratepayers. Dealing with Mr. Jones' point that the Bill as approved by the ratepayers was not the Bill as it stood at present, Sir Lynden said that the resolution passed by the ratepayers was to the effect that the Council should promote the Bill jointly with the other Councils, "or some or one of such Councils" to constitute a Joint Board, &c. He submitted that the circumstances in connection with the Bristol Bill differed from the present Bill. The petitioners were not entitled to a *locus* as ratepayers, because they were bound by the seals of the Stretford Urban District Council and the other local authorities; and the only area in respect of which any question could arise was that of Sale. But in Sale the only petitioner was the Manchester Ship Canal Company, with a rateable value of £245 out of a total of £101,000; and that representation did not allow them to be heard.

Sir James Greig asked whether the resolutions were submitted to the ratepayers in the various districts at about the same time.

Sir Lynden Macassey said he was informed that all the meetings were held on the same day.

The room was then cleared, and the Court deliberated in private. On the re-admission of the parties,

The Chairman announced that the Court would grant the *locus*.

CROYDON GAS BILL.

This Bill (see the "Journal" for March 1, p. 515) was on Tuesday of last week ordered to be reported for third reading by the Unopposed Committee of the House of Lords, presided over by the Earl of Donoughmore (the Chairman of Committees). No material amendments have been made since the Bill was deposited, except that a small drafting amendment was made to the preamble to show that a further £70,000 of debenture stock has been raised.

SHEFFIELD GAS BILL.

This Bill (see the "Journal," Jan. 18, p. 151, and April 5, p. 42) was on Tuesday of last week ordered to be reported for third reading by the Unopposed Committee of the House of Lords. There have been no material amendments made since the Bill left the House of Commons.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" regarding applications to the Board of Trade for Orders under the Gas Regulation Act.

St. Austell Gas Company, Ltd.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

South Elmsall, South Kirkby, and North Elmsall Gas Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6d. per therm.

SPECIAL ORDERS.

Eye Corporation.

The Corporation of Eye are applying for a Special Order to empower them to acquire the undertaking of the Eye Gas Light and Coke Company, and to borrow money for the purpose.

Sutton Gas Company.

Application is to be made by the Sutton Gas Company for a Special Order to authorize them to raise additional capital, to make new provisions with regard to the dividends payable and the charges leviable for the hire of prepayment meters and fittings, to hold annual meetings, and to regulate the supply of gas.

Walton-on-Thames and Weybridge Gas Company.

Application is being made by the Company to the Board of Trade for a Special Order under section 10, to provide for the holding of annual instead of half-yearly meetings, to authorize the declaration of interim dividends, &c.

DECLARATIONS OF CALORIFIC POWER.

Bath Gas Light and Coke Company.—480 B.Th.U. (May 31.)
Bristol Gas Company.—480 B.Th.U. (July 1.)
Hyde Gas Company.—450 B.Th.U. (May 31)
Otley Gas Company.—500 B.Th.U. (July 1.)
Swanage Gas Company.—450 B.Th.U. (June 24)

GAS REGULATION ACT ORDERS.

There have been received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Llantrisant and District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, "17 6d. per therm" shall be substituted for "4s. 3d. per 1000 c.ft." in section 55 (limit of price for gas for public lighting) of the Llantrisant Gas Act, 1913.

Prepayment meter clauses are included. (May 15)

Pontypool Gas and Water Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm.

Prepayment meter clauses are included. (May 16.)

Yeovil Corporation.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15·4d. per therm. (May 16.)

HEREFORD GAS EXTENSIONS.

The Hereford City Council have unanimously approved the recommendation of the Gas Committee to borrow £12,000 for the installation of more up-to-date plant for the production of gas.

Alderman WITTS, moving the adoption of the recommendation, remarked that recently he had stated that the Gas Committee in the immediate future would possibly have to bring forward a scheme for extending their plant. As a matter of fact, ten years ago they had a report from the then Manager of the gas-works recommending the very scheme he was now putting forward. The Committee submitted the report with two objects in view. The first was to provide a sufficient quantity of gas to meet the increasing demands; and the second was to reduce the price charged for gas. Experts had freely given their advice; and he and two other members had visited some of the best gas-works in the kingdom, and returned with the conviction that in Hereford they were very much behind the times.

Mr. J. C. M. VAUGHAN seconded the report, and said that at first he did not agree to the expenditure at present of £12,000 on the works. But while on a visit to the North of England, he showed their report on the matter to the Manager of one of the largest gas-works in that part of the country, and asked for his candid opinion. The reply was: "Where on earth have you been to in the last ten years? What happy place do you come from to let your works be in this position? By all means do what is suggested as soon as possible." He was therefore now in favour of the recommendation.

Mr. MOORE was not hostile to the scheme, but criticized the action of the Committee in keeping the Council and the citizens in the dark as to their actual position.

Mr. DYMOND expressed the opinion that one of the most important points was that they had to do something to ensure an adequate supply of gas at once. Vertical retorts could not be obtained within the time they would be required; and it was a water-gas plant or nothing, to get them over next winter.

Alderman WITTS, replying, said he had frequently called the Council's attention to the danger of a shortage in the gas supply. With regard to the alleged danger of poisoning by carbon monoxide, he was a large consumer of gas, and would continue to be.

The recommendation was adopted.

REPORT OF THE LIVESEY PROFESSOR AT LEEDS.

Prof. John W. Cobb, C.B.E., B.Sc., London and Leeds, F.I.C. (Livesey Professor at the University of Leeds), has submitted his annual report, for the session 1920-21, to the Chairman (Mr. C. F. Tetley, M.A.) and members of the Livesey Advisory Committee, on the work of the Department of Coal Gas and Fuel Industries (with Metallurgy).

The number of students in the session 1920-21 reached the highest figure in the history of the department. In the present session, the new entries show some falling-off; and thanks to the consideration of Prof. Poole, the present congestion is being met by the installation of ten working benches in the General Laboratory of the Mining Department. The students may be classified thus:

	1920-21.		1921-22.
Fuel and gas engineering	27	..	23
Fuel and metallurgy	14	..	16

All the ordinary day classes have been held; and some alterations have been made. The course on the Properties of Gases by Mr. Hodsman has been divided into two parts; the first, dealing mainly with the physical properties, being now given to second year students, and the second, on chemical properties, to third year students. The growth in subject-matter made this change necessary. The engineering training has been modified by the institution of a special lecture course, mainly for students of this department, in which two terms are given up to Mechanical Engineering, and the third term to Electrical Engineering, with accompanying work in the laboratories. Developments in the application of electrical power make it desirable to give our students at least an introduction to electro-technology. The special evening classes have been again given and well attended.

(1) *The Distribution of Gas* (twelve lectures), by Mr. Walter Hole. This is a revival of a course given in alternate sessions prior to the war.

(2) *Coke-Oven Practice* (eight lectures), by Mr. W. Greaves, given in alternate years.

(3) *Steaming in Vertical Retorts* (two lectures), by Dr. A. Parker, who gave a summary of this important subject based mainly upon the experiments of the Gas Investigation Committee of the Institution of Gas Engineers at Uddingston.

(4) *Metallurgy* (six lectures, with laboratory work), by Mr. P. F. Summers. In this course one lecture is given each evening, followed by appropriate laboratory work. The first three evenings were spent on elementary work, forming a general introduction to Metallography, while the second three were given up to more advanced work on a special subject, the iron-carbon alloys. These classes have again proved a recruiting ground for day students.

Forty-nine external students in all attended these courses, in addition to the full-time registered students of the department.

DONATIONS.

As mentioned in the last report, the endowment funds of the department have been in this session benefited by substantial donations:

£1000 from the South Metropolitan Gas Company.
£200 from the South Suburban Gas Company.
£525 from Mr. A. G. Glasgow. (Messrs. Humphreys and Glasgow).

Thanks are given to the following firms and gentlemen for gifts of specimens, drawings, &c., of use to the department.

Special Samples of Coal and Bye-Products:

Gas Light and Coke Company.
South Metropolitan Gas Company.
Birmingham Corporation Gas Department.
Bradford " " "
Leeds " " "
Fuel Research Board.

Specimens of Refractory Materials:

Mr. T. Arthur Acton (Minerva).
Messrs. Woodall, Duckham, and Jones (1920), Ltd.
The Farnley Iron Company, Ltd.
The Armitage Works Company, Ltd. (Deepcar).

STAFF.

In the session 1920-21 there were no staff changes. In the session 1921-22, an addition has been made by the appointment of Mr. E. C. Williams, M.Sc., A.I.C. (late of the British Dyestuffs Corporation, Ltd.), to be Research Chemist to the Joint Research Committee of the University and the National Benzole Association for benzole research.

RESEARCH.

Mr. A. C. Monkhouse continued to hold the Gas Research Fellowship, studying under Prof. Cobb's direction the liberation of nitrogen from coal and coke as ammonia. For his thesis on this subject, he was awarded the degree of Ph.D.—the first awarded by this University—and the results so far obtained have been published in a report to the Institution of Gas Engineers. Dr. Monkhouse continues to hold the Fellowship.

Mr. H. D. Greenwood, B.Sc., carried out work on the structure of cokes prepared at different temperatures and on the gases contained in

coke. Mr. Greenwood also worked during the session 1920-21 under Mr. Hodsman's direction on the oxidation of ammonia under conditions obtaining in carbonization, and was awarded in June, 1921, a first-class honours B.Sc. degree and his M.Sc. degree for his thesis on this subject. The results are of considerable theoretical interest and practical importance. Mr. Greenwood received an appointment under the Buxton Gas Department last summer; and the work is being continued by Mr. R. A. Mott, B.Sc.

Mr. Mott, who graduated in June, 1921, is examining some aspects bearing particularly on the losses of ammonia in coke-oven practice, having received a University grant for the purpose. He has also been investigating the cause of the pink discoloration sometimes found in bye-product sulphate of ammonia.

Mr. L. P. Ingram, who graduated in June, 1921, with second-class honours, has been continuing the development of a laboratory apparatus for coal distillation, from which it is hoped to obtain good results. Special samples of coal have been supplied to us in this connection from which the yields on the working scale had been carefully ascertained. Mr. Ingram also carried out at Truro vacation tests on the downward steaming of vertical retorts.

Mr. H. S. Houldsworth has continued his studies of the thermal expansion of refractory materials, and in particular has been engaged in investigating the properties of the different modifications of silica. The results have been published before the Ceramic Society.

The Joint Research Committee of the University and the Institution of Gas Engineers has continued to act as Research Sub-Committee to the Gas Investigation Committee of the Institution, and work has been carried out under Prof. Cobb's supervision in two branches.

In one branch, Mr. James W. Wood, assisted by Mr. G. B. Howarth, has been engaged upon a critical study of the reliability of recording gas calorimeters, and, indeed, of gas calorimetry in general. The results formed the subject of a report to the Institution of Gas Engineers, to whom the introduction of the Gas Regulation Act of 1920 made the matter one of importance and urgency.

In another branch of the work, Dr. A. Parker, with the assistance of Mr. H. Kerr and Mr. F. S. Townsend, has been investigating the efficiency of production of blue water gas, which has also formed the subject of a report to the Institution of Gas Engineers. This is complementary to preceding work on the steaming of vertical gas-retorts. Our best thanks are due to the Birmingham Corporation Gas Department for the exceptional facilities they continue to provide for these investigations.

The scope of the research work carried out in the department has been enlarged in one direction, as a consequence of the action of the National Benzole Association, who invited the University to form a Joint Committee for the investigation of matters pertaining to the benzole industry. It was the wish of the National Benzole Association that the Committee should be constituted on the same lines, and work in the same manner, as the Joint Research Committee of the University and the Institution of Gas Engineers. This has been done, and the Joint Benzole Research Committee of the National Benzole Association and the University of Leeds has been formed, with Mr. S. Henshaw as its first Chairman, and the following membership.

Representing the National Benzole Association:

W. G. Adam, B.A.
T. Howard Butler, Ph.D., M.Sc., F.I.C.
S. Henshaw, F.I.C. (*Chairman*).
S. A. Sadler.
E. W. Smith, D.Sc., F.I.C.

Representing the University of Leeds:

J. W. Cobb, C.B.E., B.Sc., F.I.C. (Professor of Coal Gas and Fuel Industries).
J. B. Cohen, Ph.D., F.R.S. (Professor of Organic Chemistry).
A. G. Perkin, F.R.S. (Professor of Colour Chemistry and Dyeing).
Granville Poole, B.Sc., M.Inst.M.E. (Professor of Mining).
A. Smithells, C.M.G., B.Sc., F.R.S. (Professor of Chemistry).

Work as arranged by the Committee will be carried out under the supervision of Prof. Cobb by the Research Chemist (or Chemists), who will be a member of the University Staff.

Mr. E. C. Williams, M.Sc., who has received this appointment, graduated in 1914 at the University of Manchester, at the head of the first-class honours list in the School of Chemistry. He was awarded the Mercer and Dalton Research Scholarships for research theses, and a special University Prize for Physical Chemistry. His M.Sc. was gained by research. After two years' service in the army, where he gained the rank of Captain, Mr. Williams was appointed Research Chemist to British Dyes, Ltd., and during the past four-and-a-half years has been engaged, not only upon laboratory research, but on large-scale work and administration—as Head of the department at the Dalton Works, Huddersfield, for the manufacture of intermediate products. Mr. Williams's work will centre at the University of Leeds in the Department of Coal Gas and Fuel Industries, where Laboratory facilities are provided, but will also be carried out as far as may be found desirable on the plants engaged in benzole production and laboratories attached thereto.

FORMER STUDENTS AND GRADUATES.

All the students who graduated in Gas Engineering in June, 1921, have received employment.

Mr. L. P. Ingram, B.Sc., second-class honours, 1921, Assistant Engineer and Chemist, Plymouth Gas Company.

Mr. H. D. Greenwood, M.Sc., Technical Assistant, Buxton Corporation Gas Department.

Mr. J. A. Hepworth, B.Sc., Junior Engineer, Gas Light and Coke Company, London.

Mr. J. F. Levisohn, B.Sc., Drakes, Ltd., Halifax.

Of the two graduates in Fuel and Metallurgy, Mr. A. Henderson, B.Sc., has been appointed Metallurgical Chemist to Messrs. E. J. Smith and Co., Birmingham, while Mr. W. S. Patterson, B.Sc., is proceeding to an honours degree course.

WORKS FACILITIES.

During the vacation, students have been given opportunities of obtaining works experience; and for these facilities, best thanks are due to the following: The Bilston Gas Company, Bradford Corporation Gas Department, Bridlington Gas Company, British Gas Light Company, Ltd., Norwich, Colchester Gas Company, Glasshoughton Coke-Ovens, Haworth Gas Company, Keighley Corporation Gas Department, Leeds Corporation Gas Department (New Wortley), Leeds Forge, Ltd., Walter Scott, Ltd. (Leeds Steel Works), Ladysmith Coke-Ovens, Whitehaven, Old Silkstone Collieries, Ltd., Barugh, Ossett Gas-Works, Ravensthorpe Gas Company, Scarborough Gas Company, St. Helen's Colliery and Brickworks Company, Ltd., Workington, Waterloo Main Colliery Company, Ltd., Leeds, Wells Foundry, Keighley, Yorkshire Coking and Chemical Company, Ltd., Castleford.

PUBLICATIONS.

The Reversible Thermal Expansion of Fireclay and other Refractory Materials, by H. S. Houldsworth and J. W. Cobb, "Trans. Soc. Glass Tech.," 1921, Vol 5—dealing with fireclays and the influence of temperature of previous burning.

Note on an Apparatus for Sodium Peroxide Fusions, by H. J. Hodsman, M.B.E., M.Sc., F.I.C.—"J.S.C.I.," Vol. XL., No. 7, p. 741. The apparatus is primarily intended to facilitate the determination of the sulphur in fuels.

Fifth Report of the Gas Investigation Committee (1921), on Gas Calorimeters.

Sixth Report of the Gas Investigation Committee (1921), on the efficiency of the blue water-gas process.

The Liberation of Nitrogen from Coal and Coke as Ammonia, by A. C. Monkhouse and J.W. Cobb—issued under the head of Report on Gas Research Fellowship.

Fuel, by H. J. Hodsman and J. W. Cobb, Annual Reports of the Society of Chemical Industry on the "Progress of Applied Chemistry," 1920, Vol. V.

The Production of British Thermal Units, by, J. W. Cobb, Special Article "GAS JOURNAL," Vol. CLIII., p. 89.

Carbonization, by H. J. Hodsman, "GAS JOURNAL," Vol. CLIII, p. 90.

Steaming, Water Gas, and Complete Gasification, by Dr. A. Parker, Special Article, "GAS JOURNAL," Vol. CLIII., p. 91.

Utilization of B.Th.U. in Heating and Lighting, by J. W. Wood, Special Article, "GAS JOURNAL," Vol. CLIII., p. 93.

Finally, Prof. Cobb once more places on record his appreciation of the good work done in this department by the whole of his staff, and particularly by his Chief Assistant, Mr. H. J. Hodsman, Lecturer in Gas Chemistry.

CITY AND GUILDS OF LONDON EXAMINATIONS.

Coal-Tar Distillation and Crude Intermediate Products.

Below are reproduced the questions which were set by the Examiner, Mr. W. H. Coleman, on May 4 and 6, to candidates in the written and practical examinations in Coal-Tar Distillation and Crude Intermediate Products, held under the auspices of the City and Guilds of London Institute.

The maximum number of marks obtainable was the same for each question, and no more than six were to be attempted. Candidates were cautioned to avoid giving in their answers any particulars of processes used in the works in which they are employed which are not matters of public knowledge.

1. Compare the following systems of distilling tar: (*a*) The ordinary pot still; (*b*) the pot still combined with a condenser-preheater; (*c*) the continuous still, Wilton type; (*d*) the continuous still, Hird type.

2. How would you arrange to take the fractions from the tar still and work-up the crude fraction if you desired to obtain, with the least expenditure of time, labour, and material, (*a*) the highest yield of 60's carbolic and (*b*) the highest yield of cresylic acid?

3. Give some account of the substitutes for natural resins obtained from coal tar, and describe how any one of them is manufactured.

4. Compare the intermittent and continuous systems of fractionating stills used for the production of 90's benzole.

5. What do you know about low-temperature tar? Compare its composition and properties with those of ordinary gas-works tar.

6. What do you consider to be the best method of manufacturing 78's naphthalene? Describe, with sketches, the plant you would employ to carry out the process you prefer.

7. What are the advantages of neutral sulphate over the ordinary quality? How would you arrange your plant to obtain a satisfactory neutral sulphate?

8. What special properties should pitch possess to be suitable for (*a*) road paving, (*b*) briquetting, (*c*) road making?

FINAL EXAMINATION—PRACTICAL TEST.

The maximum number of marks obtainable was affixed to each question. Candidates had to write in the answer papers provided both their answers to questions and accounts of the work carried out and results obtained. Only three questions were to be attempted; and attention was called to the higher marks carried by the first four.

1. What is the sample marked A? Describe it and state your opinion of its quality, basing your remarks on the results of the tests you apply. (100 marks.)

2. In the sample of naphthalene marked B, determine the melting-point, and the percentage of tar acids. (100.)

3. Determine the volatile and total ammonia in the sample marked C. (100.)

4. Determine the twisting point and volatile matter in the sample of pitch marked D. (100.)

5. How would you detect and estimate ammonia in a sample of 90/140 pyridine? (50.)

6. Describe the method of estimating either (*a*) carbazole in crude anthracene, or (*b*) finished 90/140 pyridine in a sample of crude pyridine. (50.)

PRIMITIVA GAS COMPANY OF BUENOS AIRES, LTD.

The Outlook Brightening.

The Twenty-First Annual General Meeting of the Company was held at River Plate House, Finsbury Circus, on the 16th inst., when the Chairman (Sir ALBERT E. BOWEN, Bart.) was able to submit an improved balance-sheet to the proprietors.

The SECRETARY (Mr. J. M. Macmorran) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, referred to the slightly better account the Board were this year able to present to the shareholders. It was still very bad, he said, but there were hopeful signs of their having turned the corner. If they would bear in mind that during the year under review the Company still had to contend with the great strike, which only terminated on March 14, 1921, that owing to the dockers' boycott of the Company they had to pay very large sums for demurrage on their steamers, and that they only obtained the advantage of lower freights and the cheaper British coals in October, the proprietors would agree, he thought, that their prospects were brighter than they had been since the war. As a matter of fact, fuel (coal, timber, oil, &c.) costs showed a decline of only 2s. 11d. per ton on 1920, the worst year; but it looked as though these cheaper freights and coals were likely to continue, and, this being the case, they ought during the current year to do better than in 1921. They must always remember, however, that selling prices of gas in Buenos Aires were based upon a sliding-scale. In the case of fuel consumed during the year under review, a considerable amount of wood had still been used, because, on the whole, the mixture came out more advantageous, for the time being, than carbonizing coal alone; and, of course, they had to use gas-oil in the water-gas plant. Oil was very dear during the year, but was now a little cheaper. The net result of the year's working showed a revenue profit of £66,337 in place of a loss of £42,813 for the previous year. This was, of course, far from satisfactory, and the amount of profit very far from that of pre-war days; but, on the other hand, the re-establishing of a profit in place of the continual loss after loss was at least an indication of the turning-point having been reached —the improvement on the net result of the previous year's working amounting to £109,151.

ARGENTINE TRADE AND POLITICS.

Trade and business generally in the City of Buenos Aires were disheartening all through the year; and many people were hard-hit by the enormous slump in prices, especially in the cereal and meat businesses, the backbone of the country. The cereal crop was fairly satisfactory, but prices showed an enormous decrease on the immediate after-war figures; while cattle became almost unsaleable, and, even now, there was no improvement in this direction. He had heard of cows being sold at from $5 to $10 per head in order to free the camps, as the graziers could not carry them. How long this was likely to last, he did not know; but there seemed a surplus of meat in the world, or rather there was a dearth of purchasers from want of money and owing to the dreadful condition of the exchanges. Then all through the year politics in the Argentine had been in the ascendancy and had seriously interfered with business conditions; but the elections for the new President and part of the members of the Senate and Chamber of Deputies took place on April 2, and there was now hope for an improvement in political conditions for a year or two.

DIFFICULTIES.

Reference had already been made to the serious loss sustained owing to the general strike and boycott of the Company by carters, dock workmen, and labour unions generally; and it was not until March 14, 1921, when they had replaced all strikers and completely broken-up the Gas-Workers' Union, that the Argentine Workmen's Federation decided to lift the boycott and leave the Company to conduct business in their own way. If they had submitted to the demands of the workmen, they might just as well have shut-down altogether. It was absolutely vital that they should break the strike; and the General Manager in Buenos Aires was much to be congratulated on having done so. Since then the men had worked well, and as far as they knew were now quite contented. The great trouble, however, was the fact that during the war, and owing to the strike troubles, they were unable to supply gas of any reasonable quality, with the result that many large consumers gave-up using gas and reverted to petrol, oil, &c. They were now attempting to regain their *clientèle;* and, with this object in view, they had been, and were, conducting house-to-house propaganda, which up to the present had given decided results. But even to-day the sale of gas was only about one-third of what it was in 1913. The shareholders would understand that the Company's organization was built-up to cater adequately for the large business they were doing in 1913. Capital expenditure was based upon an increasing consumption of gas every year; and it had been extremely difficult to bring down overhead charges in consonance with the reduced consumption of to-day. If they could only get back to something like the 1913 consumption figures, they would do very well on the sliding-scale contracted for with the Municipality; but they had to fight enormous difficulties, because so many people, having turned over to consumption of wood, oil, petrol, &c., and not being certain that the Company would be able to continue adequate supplies of really good gas, were loth again to alter their installations. Then another grave difficulty was the fact that the coke consumers of pre-war times had to find other means of supplying their wants, because they had no coke to sell; but now the Company were getting good British coal and had plenty of coke, they were confronted by the fact that there were very few buyers and that prices had to be cut to compete with the wood and oil. Very large supplies of coke, amounting to some 18,433 tons, had accumulated at the end of December, 1921, and they had found it almost impossible to dispose of any large quantity, but had made some new arrangements which it was hoped would enable them to get rid of the accumulated supplies and those being made every day. It was necessary to write-down the value of coke in stock from $50 (paper) per ton, as it was on Dec. 31, 1920, to $40 (paper) per ton; while the average net price received for coke was $50.15 during 1921, as against $80.36 per ton in 1920. This writing-down of the coke and breeze in stock lost approximately £10,000. There was another point—that as they had been able at last to abandon the use of timber, bran, shale, and other substitutes adopted during and since the war, the gas now produced was of a very much better quality, selling at a higher price; and this naturally affected the consumption per client per month to the extent that, while the average amount of gas consumed per customer in 1920 was 76·18 cub.m., the amount paid for per consumer only averaged 63·03 cub.m. in 1921—a difference of practically 16 p.ct. This was due, not to the loss in the number of consumers, but to a general decrease in the average quantity of gas used per consumer on account of economy or owing to the improved quality of the gas produced.

PRICES AND PRODUCTS—EXPENSES AND EXCHANGE.

The average price charged for gas during 1920 was 23·3 c. (paper) per cub.m., while in 1921 the price charged averaged 25·03 c., or an increase of 1·73 c. per cub.m. In his opinion, there was very little doubt that the gas consumers in Buenos Aires considered gas prices too high; and if by any good fortune they were enabled to reduce them, he felt sure many old consumers would come back. They would, however, easily realize from the accounts that they were not in a position at present to make any serious reduction. He had already referred to the cost of fuel. Coal was £6 18s. per ton during 1920, and £4 during 1921, while the quantity of coal carbonized increased from 35,567 tons in 1920 to 61,958 tons in 1921. The quantity of water-gas oil consumed during the year was only about one-half the amount used in 1920; but this was chiefly due to the excessive cost during the first part of the year, when it was over £12 per ton, which made it practically impossible for their purposes. It was a matter of interest that they had already purchased 1000 tons this year at somewhat under £9 per ton delivered. The yield of gas per ton of coal and wood used in the retorts during the year averaged 14,398 c.ft. per ton, against 11,601 c.ft. in 1920. This increase in the yield (which amounted to some 24 p.ct. on the production of the previous year) was to a great extent due to the adoption of a new principle—that of complete gasification of coal in part of the retorts. This new system was adopted because of the accumulation of coke which could not be profitably disposed of. A further item of expense was the cost of feeding and maintaining workmen within the Company's works during two months of the strike in the early part of the year. They would have been in danger of losing their lives had they left the works, and it was necessary to keep them there and feed them. The chemical products branch of the business had not done so well, owing to decreased profits on sheep-dip. This decrease amounted to some £9000 when compared with the previous year; the principal reason being the delay in obtaining a certificate from the Minister of Agriculture, which was all at once sprung upon the Company as being necessary before they could sell the product. Now "Acaroina" was recognized as one of the official dips, and they had very little fear of serious competition in future, providing crude materials, such as creosote oil of a suitable quality, could be obtained at a reasonable price. Another cause of trouble was the considerable losses in exchange during the year. The Argentine dollar, which two years ago was as high as 70d., fell to 41d.; and as, of course, their income was in paper dollars, and they had to pay for all materials and coal in sterling, the matter was a very serious one. The loss in exchange amounted to £9116; and, owing to want of working capital, caused by their losses, £7681 was paid in interest. It might worry the proprietors if he went through all the details of the economies which the General Manager had been able to obtain in administration, but it was assumed that he had done his very best to reduce the establishment charges to the very lowest figures, and that whenever he had seen the possibility of saving a penny, he had done so. They had three complete gas-works in the City—at Patricios, Corrales, and Belgrano. The latter had been completely closed-down. At Corrales, where the chemical works were situated, they were almost entirely closed, so that they were producing at Patricios all the gas they could sell. This would show how much of the capital was at present earning nothing. Two letters had been received from shareholders complaining of the London Office expenses, and saying that they ought to be reduced, but there also they had cut things to the bone. He had referred in previous addresses to the serious handicap experienced in being very short indeed of working capital. They had to buy as and when they could, and did not necessarily always get advantages which, if they had money to pay with, could be insisted upon. In fact, it was a wonder to him how they had managed to carry on as long as they had done.

ON GOOD TERMS WITH THE MUNICIPALITY.

Relations with the Municipality were very good. Regarding the paragraph in the report referring to clause 5 of the contract by which the fixing of the capital of the Company should have been concluded by Jan. 10, 1922, their figures were all ready and were entirely at the disposal of the Authorities, and had been all along; but only slight progress had been made, because the Authorities were finding it a big job to check all the figures and measurements supplied to them, and they apparently were not yet in a position to deal with the figures. This, however, need not unduly alarm the shareholders, because, after all, it was only a matter of fixing the capital value of the Company's installations and plant for the purpose of the purchase by the Municipality if that should become possible. They might be sure that every possible attention would be given to the matter. The Municipality had got a little behind in its payments for gas supplied to different departments; but it was nothing serious, and they were able to set-off against these accounts what was owed for the Municipal gas-tax. The cost of general upkeep charged to revenue during the year had been fairly heavy—£10,000—owing to the abnormal amount of repairs which it was necessary to carry out, principally in the chemical factory. An item in the report requiring explanation referred to the transfer of the Sale Contract for the electric section from the Deutsch-Ueberseeische Elektricitäts Gesellschaft to the Compañia Hispano-Americana de Electricidad. The Germany Company sold-out to the Spanish Company, and asked for a transfer of the contract. A long negotiation

with them ensued as to the *quid pro quo*, and eventually they agreed to pay £2500 per annum for the duration of the contract, which has not been in any other way varied in its conditions. The Company's security was precisely the same as before; but they told the German Company they were not in a position to forego any of their rights without payment. It would be seen from the balance-sheet that this amount of £56,250 figured on the credit side, and was included in the "Sundry Creditors and Credit Balances" on the debit side. There was no need for him to refer in detail to the figures of the balance-sheet. The principal alteration was the one explained—of the further liability assumed by the Spanish Company of £56,250 (on the credit side). Stocks of coal, oil, and stores in Buenos Aires and in transit had been somewhat increased during the year, and were now £553,274. With regard to profit and loss account, the revenue showed a credit of £66,337 against a debit of £43,142 last year.

PROSPECTS.

Regarding the future, it depended on whether the consumption could be raised. The profits obtained during the year had undoubtedly been at the expense of a large loss in consumption, for the reasons already given; and while it might be possible that this consumption was not irretrievably lost, the only means of re-establishing it seemed to be some further sacrifice for a time at least. Personally, he was of the opinion that the Argentine would soon overcome its present financial and political troubles and revert to a condition of prosperity. It must not be forgotten that quite recently the Argentine Republic had obtained a local supply of crude petroleum in very large quantities, that this petroleum could be put on the market in Buenos Aires at a price with which British and American coal could not easily compete, and that its use had become well-established among people who formerly used gas for cooking, power, &c. This was a most serious competition to face, and he could not say whether they would be successful in overcoming it. He feared the use of crude petroleum as a fuel had not only come to stay, but would become more general almost every day. This meant greater difficulty than ever in disposing of their coke and breeze. However, the Company had succeeded in carrying on up to the present against difficulties which at one time appeared insuperable. They had no money and very little credit, but had been able to keep the business going so far. The whole of the Company's installations had been maintained in good condition and in good working order.

THE RECONSTRUCTION PROBLEM.

They had discussed at some recent meetings the possibility of finding a basis for the reconstruction of the Company. He (the Chairman) had given a great deal of time and attention to the matter, and had drawn-up several schemes and discussed them with their financial advisers and others; but he had found it absolutely impossible to arrive at anything which he could safely put before the proprietors. It would be no use asking them to write-down the ordinary capital, some of the preference capital, to write-off some or all of the accumulation of dividend on the preference capital, or anything of the kind, because there was no definite chance of carrying out the conditions of any scheme (which would necessarily be based on the payment of dividends in the future) when this year they were only able to pay their fixed charges with a surplus of less than £1000. It was absolutely useless to talk of formulating any scheme which would require (say) £100,000 to £150,000 of profits per annum to make it worth while. Therefore, they must just exercise their souls in patience and hope for the best. He could assure them that as soon as the Board saw any possibility of formulating a reasonable scheme, they would put it before them. Before concluding, the Chairman mentioned that the results of the Company's operations for the first three months of this year were: January, £4217; February, £2887; March, £3614—total, £10,718.

Mr. H. E. Jones (Vice-Chairman), rising to second the adoption of the report, referred to the melancholy history that had been given to them of the past year's working. Much had been said about petroleum; but he would like to point out to the shareholders that with its aid they could treble their output of gas. With regard to gas generally, they were aware he had been widely concerned with gas in India, on the Continent, and in this country, and it was sufficient to read the papers in order to see that the position of the gas industry everywhere was improving. He was far from dejected. Buenos Aires was a magnificent city, and sales of gas there must come right. When coal was costing £5 or £6 a ton, they could imagine no board of directors could contend with the position. They must work their span out.

Mr. W. H. Skeel supported the motion, saying that he preferred the Chairman's speech, as he was bound to regard it as far from melancholy. A fine fight had been made; and if only £1000 had been gained, those who had hoped were not disappointed.

Mr. E. C. Humphreys thanked the Board for adopting his last year's suggestion as to submitting a revenue account. The first gloomy word therein was "Taxes;" and he hoped these were met by provisions relating to the price of gas chargeable. "Bad Debts" was a disagreeable entry. However, they must be thankful they could now show a balance on the right side; and doubtless the current year would bring an improvement. He hoped the Chairman's optimism would be justified, and said he was sure he would do his best to restore the Company's fortunes.

Mr. Ernest Wooley gave further support, and praised the Board and the Chairman for their work. Their General Manager had assured him there was no doubt as to the future, providing coal came along for them.

After a brief reply by the Chairman, the motion was adopted.

Thereafter, the re-election of Mr. C. P. Ogilvie and Mr. F. C. im Thurn (the retiring Directors) took place—proposed in each case by the Chairman and seconded by Mr. H. E. Jones and Mr. Ross Pinsett respectively. The re-election of the Auditors (Messrs. George A. Touche & Co.) was moved by Mr. W. J. Hodge and seconded by Mr. Joseph M'Andrew.

The resolutions were carried unanimously.

On the proposition of the Chairman, seconded by Mr. Andrew Woolmer, a hearty vote of thanks was accorded the General Manager and his staff in Buenos Aires and the Secretary (Mr. Macmorran) and the staff in London. This was carried *nem. con.*, as was a vote of thanks to the Chairman and Board of Directors (proposed by Mr. Humphreys and seconded by Mr. S. Watkinson), which closed the proceedings.

SOUTHEND CORPORATION AND LEIGH GAS UNDERTAKING.

Terms Proposed for Sale.

A Special Gas Committee of the Southend Town Council have submitted a report in which they recommend that the Council approve the transfer of the Corporation's Leigh undertaking to the Southend Gas Company, upon terms set-out in the report. The Committee were originally constituted for the purpose of considering generally the question of the gas supply for the borough, in view of the largely increased demand which may be looked for in the future, both in the Leigh and the Southend areas; and in this connection they communicated with the Southend Gas Company, and considered the alternatives which presented themselves—namely, the purchase of the Company's undertaking by the Corporation or the sale of the Leigh undertaking to the Company.

Having weighed the respective positions of the two undertakings, and the measures which it would be necessary for the Corporation to take if a separate supply was to be maintained in the Leigh district, the Committee recommended that the Council should approve in principle of the sale of the Leigh undertaking. Following the acceptance of this recommendation by the Council, and in accordance with their instructions, the Committee have for some time past been in negotiation with the Company with the view of ascertaining the possibility of agreeing such terms as the Committee could recommend the Council to accept as a consideration for the transfer of the undertaking to the Company. Prolonged negotiations have taken place between representatives of the Company and of the Committee; and as a result terms have been provisionally agreed for submission to the Council and to the Company respectively. These, if accepted, will be embodied in an agreement, and the necessary powers will be sought by the Company to give effect thereto.

The main terms agreed upon are for the transfer to take place on April 1, 1923. The ownership of the site of the works and of the adjoining land is to remain vested in the Corporation, together with the offices thereon. The Company are to have the free use for gas purposes of the land now used for such purposes for a period of six years from the date of transfer, and also free use for the like period of the offices thereon, subject to the Company keeping the same in good tenantable repair; the period of six years to be regarded as a maximum period, and the Company to vacate the premises earlier if reasonably possible. All other buildings and all plant, machinery, tools, and implements on the site and elsewhere vested in the Corporation as owners of the gas undertaking to become the property of the Company. At the expiration of the period of six years or earlier, the Company are to remove at their own cost from the site of the works the whole of the buildings, plant, &c., which are their property, and to clear the site. The Company are to pay to the Corporation from the date of transfer the amounts from time to time as they become payable by the Corporation in respect of principal and interest or sinking fund charges on moneys borrowed by the Corporation on account of the undertaking up to the date of transfer. This amount was approximately £45,000 at March 31 last. The Company are to pay to the Corporation a further sum of £20,000, by forty equal half-yearly instalments of principal and interest (5 p.ct.) combined. The Corporation are not to oppose any application made by the Company to Parliament or to the Board of Trade to repeal section 16 (capital redemption fund) of the Southend-on-Sea Gas Act, 1914, and section 12 (amendment of section 16 of Act of 1914) of the Southend-on-Sea Gas Act, 1920, and to substitute therefor provisions fixing the standard rate of dividend of £5 12s. 6d. p.ct. per annum on the ordinary capital of the Company raised before the passing of the Act of 1920 under the powers of the Southend-on-Sea Gas Act, 1904, and the rate of 6 p.ct. per annum on the ordinary capital of the Company raised under the powers of any Act passed previously to the Act of 1904 with a standard price of 5s. 3d. per 1000 c.ft. in each case. The Committee consider that any Act or Order which may be passed or made for giving effect to these provisions should contain a clause providing that, in the event of the Manager of the Leigh Gas-Works not entering the employment of the Southend Gas Company, or, having accepted employment with them, ceasing to be so employed, the Corporation shall pay to him during life an annuity of £150; and the Committee suggest that the Gas Company should be asked to insert such a provision in any Act or Order which they may apply for.

At a recent meeting of the Gas Committee the Borough Accountant submitted a statement of the income and expenditure of the gas undertaking for the year ended March 31 last, showing a net loss of £3905, and of the estimated income and expenditure for the year to March 31, 1923, showing an estimated profit of £2100. He informed the Committee that, in view of the estimated profit during the current financial year, it was necessary, pursuant to the terms of the Order made by the Board of Trade on June 18 last under the provisions of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, to reduce the charge for gas 5d. per 1000 c.ft. It was accordingly resolved that the charge for gas consumed by meter be reduced to 5s. 3d. per 1000 c.ft. as from June 30 next.

The Greenock Corporation are to ask the Board of Trade for an Order under the Gas Regulation Act, 1920, to enable them to charge for gas by therms. They propose to convert the existing maximum price of 5s. to ordinary consumers into a charge of 1s. 3d. per therm, with corresponding charges for slot-consumers. It is also proposed to declare a calorific value of 410 B.Th.U.

MANCHESTER GAS PROSPECTS.

A report of the Manchester Corporation states that, in the case of the Gas Committee, the approximate account for the past year's working shows that the results are better than was anticipated.

The estimated deficiency at March 31, after transferring £38,427 from the reserve fund, was £94,449. The actual income exceeded the estimate by £7584, and the expenditure was less by £74,414—a total improvement of £81,998. In addition, there was a smaller expenditure out of revenue for capital purposes of £5804; and the sum of £23,809 estimated to clear off the previous year's deficit was not wanted. On the other hand, £4202 was paid for parliamentary charges in connection with the 1921 Bill, which were not estimated for. The total improvement was therefore £107,409; so that, in order to clear the account, the transfer from reserve fund was smaller than anticipated by £12,960, and no deficit was carried forward.

The estimates for the current year take credit for an income of £1,643,500, or £77,500 less than last year. The estimated expenditure amounts to £1,607,580, a decrease of £207,487, due to reduced cost of labour, coal, oil, and other materials. The surplus thus arising amounts to £35,920, which it is proposed to appropriate by meeting capital expenditure to the extent of £15,000, and transferring the balance (£20,920) to reserve fund.

EVESHAM GAS-WORKS RESULTS.

In moving the adoption of the Gas Committee's report by the Evesham Town Council last week, the Mayor (Alderman W. A. Fisher) said that at a meeting of the Council in November last he reported a considerable loss for the half year ended Sept. 30, due to the extra cost of coal during the coal strike. The loss on the year's working, while still a considerable item, was approximately £1000 less than it was for the half year previously mentioned.

The revenue account showed the total expenditure to have been £31,014, and the total receipts amounted to £28,314, which showed a loss for the year of £2699. The chief receipts were: Sale of gas (which was the highest on record), £16,676, against £15,116 last year; hire of stoves, £190; sale of fittings and work done, £1484; sale of residuals, £9875, against £10,473. The cost of coal for the year amounted to £18,523, against £14,763 the previous year, which was chiefly due to the high price paid for coal during and immediately after the strike. There were two ways of dealing with the exceptional expenditure. One was to obtain permission to increase the price of gas to a figure which would have brought in sufficient revenue to have balanced it during the year, and the other was to spread the recovery over a longer period. The Committee came to the conclusion that with the prospect of more normal conditions of working it appeared that at the present prices charged a sufficient profit should be made to clear the department of debt in a reasonable time, and that by dealing with the matter in this way less hardship would be inflicted upon the consumers. In addition to the above balance, £501 had been written-off capital account, and interest and instalment of loan absorbed £68. The assets showed a total capital expenditure of £46,092, off which depreciation had been taken to the amount of £10,140, leaving a balance of £35,252. The value of stocks on hand amounted to £1459, and amounts due from sundry debtors £4820. On the other side, the loan outstanding was £234, amounts due to sundry creditors were £4348, loans repaid £14,763, accumulations of profit £15,211, amount due to bankers £6971. The residual market was a falling one, and the result of the present year's working would depend largely on that. The prospects were certainly better; and if they could recover their position without having to increase the price of gas, he thought they would achieve a great deal.

Mr. Gill Smith seconded, and said he had no doubt they would be able to recover their position in the course of a year or so.

In reply to a question as to whether the diminution of the public lighting did not mean a loss to the undertaking, the Mayor said that the department lost on the public lighting, as they had to supply the gas at 20 p.c. less than the price charged to the public.

The report was then adopted.

Stow-on-the-Wold Gas-Works.—Mr. W. E. Wilkins (Vice-Chairman) reported to a meeting of the Stow-on-the-Wold Urban Council last week that he had interviewed the Directors of the Gas Company on the subject of the extension of mains, &c., to the new houses. He was told that the total cost of the installation would amount to £350, and that the outlay would not be justified for the sake of serving 25 houses. The Company would be willing to sell the gas-works to the Council, if they were prepared to buy. This caused some discussion; but there was no disposition to purchase the works, and no further action was taken.

The Remedy for Poor Lighting.—The Stanley (near Wakefield) Urban District Council last week received a letter from the Wakefield Gas Company in regard to complaints of bad lighting at Bottomboat, given in evidence at a Board of Trade inquiry in February. The General Manager of the Company (Mr. H. Townsend), feeling sure that the complaints were due to local causes, had undertaken to investigate and have the matter remedied. This had now been done, and it was found, as expected, that the trouble was due to bad fittings, faulty house pipes, and cheap and bad incandescent burners. The letter pointed out that the Company sold as cheaply as possible the best burners and mantles, the use of which would give a better light for a smaller consumption of gas. The Bottomboat gas supply had been inspected by the Company's outdoor superintendent and found quite satisfactory; and if there were complaints from any other district, the matter would be investigated there also. It was decided to thank the Company for their letter, and to send to them any complaints which might be received.

STAFFORD GAS-WORKS RESULTS.

A Satisfactory Report.

The gratification is experienced by Mr. T. H. Poulson of being, as Engineer and Manager, responsible for a satisfactory first annual report on the Stafford Corporation Gas Department. The local "Chronicle," referring to the Committee's report for the year ended March 31, says "it affords agreeable reading. Really it would not have been surprising had the annual statement of accounts been much less favourable. The financial year has not been favourable to the working of industrial concerns. There has been an intensity in trade depression which has made its unwelcome presence keenly felt. Stafford unfortunately has not escaped the evil influences of the slump; and the decreased output of gas made the successful control of the works extremely difficult. It is therefore all the more creditable that in such a financial year the Committee have been able to produce a balance-sheet of such a satisfactory character. It goes almost without saying that if the management had been weak, the weakness would have been reflected in the balance-sheet."

In their report, the Committee said the income from the sale of gas increased by £2223, and from fittings by £47; but from residuals there was a decrease of £4501—making a net decrease of £2231. In the total expenditure, after making the usual provision for depreciation, there was a decrease of £2245, leaving a gross profit—which amounted to £10,207—of £14 over that of the previous year. In the profit and loss account, loan charges were shown to have increased by £556; but there was a decrease of £1035 in income-tax, leaving a surplus of £1884 for the year—£559 more than that of the previous twelve months. There was now an undistributed surplus of £3460, of which £2500 had been voted in aid of the general district rate.

The gas made in the past year was 317,239,755 c.ft.—a decrease of 23,769,245 c.ft., or 6·97 p.ct. The decrease was explained by the coal dispute, trade depression, higher prices, and unemployment. The gas unaccounted-for equalled 4·21 p.ct., as against 4·48 p.ct. the previous year. The make per ton of coal carbonized was 17,265 c.ft., compared with 17,365 c.ft.

With regard to the large decrease in the revenue from residuals, the report stated that this branch of the undertaking had, for reasons beyond the control of the management or the Committee, been a cause of anxiety and diminished income, in spite of the fact that the output was highly satisfactory. During the year the distribution department had been most successfully re-organized by the Engineer; considerable economies having been effected to the joint advantage of the undertaking and the consumers.

PRICES OF GERMAN GAS MANTLES.

An Inquiry to be Held.

Notice is given by the Board of Trade that they have received a complaint by the Incandescent Mantle Manufacturers' Association that mantles for incandescent lighting manufactured in Germany are being sold or offered for sale in the United Kingdom at prices which, by reason of the depreciation in the value in relation to sterling of German currency, are below the prices at which similar goods can be profitably manufactured in the United Kingdom, and that employment in the incandescent mantle industry in the United Kingdom is thus being, or is likely to be, seriously affected.

The Board of Trade, in exercise of the powers conferred upon them by Part II. of the Safeguarding of Industries Act, 1921, have referred the matter for inquiry to a Committee constituted for the purposes of that part of the Act, and consisting of Sir Bernard Mallet, K.C.B. (Chairman), Mr. J. Arthur Aiton, C.B.E., Sir John N. Barran, Bart., Mr. G. A. Moore, and Mr. Arthur Pugh. The Committee are directed, after ascertaining the facts, to report to the President of the Board of Trade: (*a*) Whether the conditions specified in section 2, sub-section (1), of the Safeguarding of Industries Act, 1921, are fulfilled; (*b*) on the effect which the imposition of a duty under Part II. of the Act on goods of the class or description covered by the complaint would exert on employment in any other industry being an industry using goods of that class or description as material; and (*c*) whether, in the opinion of the Committee, production in the industry manufacturing similar goods in the United Kingdom is being carried on with reasonable efficiency and economy.

The Committee will hold their first sitting for the taking of evidence at 2.30 on Wednesday, May 31, at No. 5, Old Palace Yard, Westminster, London, S.W. 1. The Secretary to the Committee is Mr. W. W. Hobson, Board of Trade, Great George Street, S.W.; and to him all communications should be addressed.

Gas Supply of Cape Town.—The accounts for the year ended Dec. 31 will be submitted at the meeting to-day of the Cape Town and District Gas Light and Coke Company, Ltd. After paying interest on debentures and debenture stock, the Directors report, the result of the year's working is a profit of £22,410, which, with the amount of £2417 brought forward, makes a total of £24,827. The Directors recommend the payment of a dividend on the ordinary shares of 7 p.ct. in respect of the year, and that £3343 be carried forward. Sales of gas, compared with the preceding year, show a decrease of 12,317,000 c.ft. In view of the unprecedented depression and difficulties of the past year in trade, industry, and finance, the Directors consider the results of the year's working satisfactory. The sum of £31,272 has been spent on capital account; the greater portion being for additional vertical retorts which are under construction. These new retorts are much needed; and until their completion, the use of old, inefficient, and expensive retorts is necessary to supplement the supply of gas obtainable from the modern portion of the carbonizing plant. As stated in the last report, financial arrangements were made temporarily to provide for capital expenditure; and these are continuing for the present. A considerable claim in respect of excess profits duty has been made on the Company; and it is being disputed.

BRITISH MOTOR SPIRIT DEVELOPMENT.

A Remarkable Move by the National Benzole Company, which Promises the Motorist a Better and More Powerful Fuel at the Price of Petrol.

"We are in a position to give preliminary details of a remarkable development in regard to British motor spirit enterprise. If the avowed facts of the case prove accurate—and there appears to be no reason to think otherwise—the motorist will have available considerable quantities of motor spirit which may reasonably be termed ideal, or as near it as is practicable. The value of benzole is now freely known; and the only adverse factors in relation to it have been the comparatively limited supplies, and the higher cost which it involved. We are able to announce a material improvement in both directions.

During the war the supply of benzole rose to big dimensions; but owing to trade depression and other economic factors, it has unfortunately dwindled in the last two years. We believe we are accurate in stating that in recent times the output has been below 20,000,000 gallons a year, though it is gratifying to learn that once again an upward tendency is becoming slowly but surely marked.

British Controlled Petrol.

The Directors of the National Benzole Company, however, have made an astute and praiseworthy move. They have concluded a working agreement with the Agwi Petroleum Corporation which ensures a supply of British controlled petrol of a grade stated to be higher than the average quality. In future, therefore, "National" Benzole Mixture will be marketed; and we may briefly refer to the claim made on behalf of the new fuel. It will, of course, consist of a mixture of a benzole and petrol; and we are assured that both fuels will be produced to a standard quality in the same way as "National" Benzole has been produced in the past. We understand that the proportion will be "fifty-fifty," and every experienced motorist will appreciate how excellent such a mixture should prove. It should provide more power, some 15 to 20 p.ct. more mileage, better hill-climbing, less car carbonization, and be proof against pinking; and of equal importance is the question of price. It is to be sold at the same price as No. 1 petrol.

We may take this opportunity of giving one or two facts relative to the Agwi Petroleum Corporation, with Sir Joseph Davies, M.P., as Chairman. During the last year or so, a very large plant has been erected at Fawley, near Southampton, which materially adds to the oil-bunkering facilities of the port. At a recent inspection of the site, over 50,000 tons of oil were in the tanks; and the accommodation is as yet far from complete. Apart from the importation of the crude spirit, everything else is done at the Southampton plant; and the refinery can already handle over 1000 tons of crude oil per week—a figure which will shortly be enlarged to 5000 tons per week. Some secrecy is maintained about the refinery process; but we understand that it gives a higher yield than that obtainable with previously-known processes. We believe we are right in saying that the new refining process is one invented by Sir Oliver Lodge and Dr. Frank Tinker, both of whom were engaged by the Government during the war, as advisers on oil matters.

Guaranteed Supplies.

There is one other point of prime importance. The working agreement referred to is rendered doubly powerful by the guarantee of ample supplies of crude oil. These supplies are, we understand, guaranteed by the Atlantic Gulf Oil Corporation, who own large oil-tracts, pipe-lines, wharves, &c., in Mexico, where they have a number of wells in active production. It is, of course, known that some Mexican oil wells suffer from the influx of salt water; but nevertheless the output to-day is over 2,000,000 tons a year, so that there is an ample margin for the guaranteed supplies for the further development of this new British enterprise.

It is a development which looks very promising from the motorists' standpoint.

Retail Prices.

The following are the retail prices of "National" Benzole and "National" Benzole Mixture.

"National" Benzole.

50 gallon drums	. . . .	2s. 8½d. per gallon.
2 ,, tins	. . . .	2s. 9½d. ,, ,,

"National" Benzole Mixture.

50 gallon drums	. . . .	2s. 4½d. per gallon.
2 ,, tins	. . . .	2s. 5½d. ,, ,,

Huddersfield Gas-Works Deficiency.—In the annual financial statement, submitted to the Huddersfield Town Council last week, it was shown that the gas undertaking had a deficiency of £7998, as compared with £285 the previous year. This heavy deficiency was attributed by Alderman Mitchell (the Chairman of the Gas Committee) entirely to two causes—the coal stoppage, which cost the department £30,000, and the slump in values of residuals, the income from which was down by £32,000. It was reasonable to hope this deficiency would be wiped-out during the coming year.

Ashbourne Gas-Works Extensions.—At a recent meeting of the Ashbourne Urban District Council, the General Purposes Committee, having considered the proposed extension of the gas-works, stated that, in their opinion, the work was absolutely necessary, and that application should be made for a loan of £12,000. The Chairman of the Gas Committee (Mr. T. Kennedy) said he was very reluctant to recommend the spending of such a large sum of money at the present time; but they were working under a very heavy capital, and the extension was imperative if they were to give satisfaction to the consumers. They were now making 45 million c.ft. of gas per annum, which was above the quantity for which the works were equipped; and the need for additional storage accommodation had been greatly impressed upon them of late. After discussion, the recommendation to go ahead with the scheme was adopted.

READING GAS-WORKS AND THE THERM BASIS.

Much useful knowledge was gained by the forty or so members of the local Literary and Scientific Society who lately visited the works of the Reading Gas Company. The party were met by Mr. D. H. Helps (the Engineer and Manager), and after a preliminary inspection of plans in the offices, the party proceeded to the retort-house, where the processes of carbonization were explained and demonstrated. The various methods adopted, and the care which is taken to remove the impurities from the gas, attracted much attention, as also did the new vertical retort house. A visit to the sulphate of ammonia plant was made; and after an inspection of the laboratory, the party returned to the offices, where tea was served. Dr. E. W. Squire, expressing the thanks of the Society, said they much appreciated the privilege of the visit, and were indebted to Mr. Helps for the very lucid exposition he had given of the processes of gas manufacture. In reply, Mr. Helps said he welcomed the Society, because the more the public knew about the method of producing gas, and what the gas industry was doing to conserve coal supplies and mitigate the smoke nuisance, the better it would be for all concerned. He then proceeded to take full advantage of so favourable an opportunity to explain the Gas Regulation Act and the method of charging for gas on a thermal basis.

WATER-GAS PLANT FOR NEWBURY.

For the last few years, during the winter months, the Newbury Gas Department have been hard put to it to provide the supply required by their consumers. It has been an unsatisfactory and difficult time both for the producer and the consumer. There have been complaints about low pressure from the latter, while the anxieties of the Manager (Mr. W. R. Davey) have been particularly heavy; for he has had such a small margin at his disposal that any temporary breakdown of plant would have been likely to jeopardize the whole supply. However, a Humphreys and Glasgow carburetted water-gas plant has now been erected at the works, and is giving an increased production which will more than meet present needs. The plant has been installed in the old purifier-house, which has been altered and enlarged for the purpose. The installation was put in upon the advice of Mr. W. Doig Gibb; but the plans and specifications were prepared, and the whole work carried out, under the supervision of Mr. Davey.

FILLING TANK-WAGONS WITH BENZOLE.

In the annual report of Inspectors of Explosives, the following account is given of the explosion of a tank-wagon while it was being filled with benzole: "There is good reason to believe that the engine was running at the time, and the wind was blowing strongly from the tank-wagon that was being filled at the next stand-pipe. This would cause a considerable quantity of vapour to be ejected from the manhole, and to be driven over the engine of the tank which exploded. Either a spark from the magneto or perhaps merely a piece of white-hot carbon deposit thrown out of the exhaust-pipe would be sufficient to ignite the vapour; and as the so-called empty tank would probably contain a highly explosive atmosphere, this would be enough to account for the accident. This accident tends to confirm the view that we have frequently expressed—that these tank-wagons should be filled by means of a pipe leading right to the bottom of the tank, and that the filling-hose should be attached to the top of this pipe by a screwed union. The necessary vent should be covered by a diaphragm of fine wire gauze, and the dipping hole should also take the form of a pipe reaching to the bottom of the tank. The gauze of the vent must, of course, be protected by a hinged lid or otherwise, which would have to be opened during filling and emptying."

TRADE NOTES.

Wellington Tube Prices.

In forwarding one of their new price list cards (made so as to be suitable for hanging where it will be convenient for reference purpose) the Wellington Tube Works, Ltd., of Great Bridge, Staffs., point out that they are now manufacturing genuine Staffordshire wrought-iron tubes and fittings without any extra price over that usually charged by them for mild steel. The price card quotes for tubes and fittings of all sorts and sizes.

Rectangular Baffle-Plate Condensers.

Messrs. Firth Blakely, Sons, & Co., Ltd., of Leeds and Church Fenton, have received an order for a set of six of their patent rectangular baffle-plate condensers from the Solihull Gas Company. They have also on order a set of four of the same type for the Melksham Gas Light and Coke Company, Ltd., and have recently completed the erection of a similar set at the Clown Gas-Works, near Chesterfield. This type of condenser (for which high efficiency is claimed, together with the small space occupied) is thus becoming increasingly popular.

Messrs. George Wilson Gas Meters, Ltd., point out that a slight error occurred in the paragraph in last week's "Journal" announcing the removal of their Manchester works. The address of the Company's new premises is No. 268 (not 266), Stockport Road, Manchester.

The Skipton Gas Committee, being dissatisfied with the working of their water-gas plant, have been in consultation with Mr. Frank H. Robinson, the Harrogate Gas Engineer, on the matter, and have invited Mr. J. H. Brearley, of Southport, to undertake a definite inspection of the plant and report.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 23.

In the London tar products market, pitch is of an increasing interest; there being substantial inquiries for shipment this season, as well as for export over September-December next. The price appears to be 70s. to 72s. 6d. net per ton f.o.b. makers' works. Creosote is also in demand for export; the value being about 6¼d. net in bulk *ex*-makers' works. Deliveries of materials for road work are in full swing. There is also an increase in the demand for motor benzole.

Tar Products in the Provinces.

May 22.

The average values for gas-works products during last week were: Gas-works coal tar, 30s. 6d. to 35s. 6d. Pitch, East Coast, 62s. 6d. to 65s. f.o.b. West Coast—Manchester, 60s. to 62s. 6d.; Liverpool, 60s. to 62s. 6d.; Clyde, 61s. 6d. to 63s. 6d. Benzole 90 p.ct. North, 2s. 1d. to 2s. 2d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 1d. to 2s. 2d. Toluole, naked, North, 2s. 2d. to 2s. 5d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4¼d. to 4½d.; salty, 3⅞d. to 4⅛d. Scotland, 3⅞d. to 4d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., 1s. 10d. to 2s. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

The market remains dull without any change in quotations. Pitch is irregular. For prompt delivery, 67s. 6d. f.o.b. London is being paid, though from the North of England 58s. 6d. is reported. In South Wales there seems to be some demand on the part of briquette makers. Elsewhere the expected demand for road repairing and construction seems to hang fire; and the trade is beginning to fear that the local authorities are unwilling to go to their assistance. Naphthalenes are slightly better on a little more inquiry for refined qualities. The consumption of crudes for the firelighter trade has fallen off of late, as was to be expected. The lower qualities of crude are offered at £5 per ton; and refined £16 per ton. Solvent naphtha is also rather steadier, in spite of the fact that the rubber manufacturers are buying very little indeed at present. On the other hand, production is small, which keeps the price up at 2s. 4d. per gallon. Benzole is easy at 2s. per gallon. Creosote has hardened on account of declining stocks; while carbolic acid shows a considerable improvement. Makers of crude 60's are now getting 1s. 10d. per gallon; and although they say that they cannot make a profit at less than 2s. per gallon, they are beginning to extract the acid. Manufacturers of crystals are trying to raise their prices to 6d. per pound. There is also more activity in cresylic acid at 2s. 2d. per gallon for pale 97/99 p.ct., and 2s. for dark 95/97 p.ct. The improvement in intermediate products has continued, and there has been increased interest both on home and foreign account. There are no important price changes.

Sulphate of Ammonia.

There is no improvement in this fertilizer; the season of application now being practically ended. The feature of the season has been a prolonged shortage of production. This has resulted in the whole output being readily absorbed; the bulk of the production being reserved for home deliveries. This fact has been reflected in the reduced quantities exported in comparison with previous years. During April 895 tons were exported, valued at £147,687. Of this quantity 5985 tons, worth £98,186, were sent to France, 642 tons to Spain and the Canary Islands, and 126 tons to the Dutch East Indies. Italy and Japan are still out of the market. The latter country filled her requirements from the United States some time ago.

Birkenhead Gas Reports.—The Gas Committee of the Birkenhead Corporation are compiling another report on the administration of the gas undertaking; and this, it is stated, will be presented to the Town Council at the June meeting. The report of the Special Committee appointed in September to investigate the working of the undertaking has been circulated among the members of the Council as a private and confidential document. Since the report was drawn-up, the Gas Committee have held several meetings; and their recommendations will be embodied in the new report. Considerable interest is manifested in the town as to the contents of the original report.

Price of Gas at Dudley.—The Dudley Town Council lately discussed the decision of the Directors of the Gas Company to reduce their charges by 3d. per 1000 c.ft. for lighting, and 6d. for industrial purposes. Alderman Lloyd, who had headed a deputation to the Directors, said they suggested three grades of charges, but these were rejected. The Streets and Lighting Committee had invited representatives of the Company to a further conference; but the reply was to the effect that the Directors failed to see that any good purpose would be served thereby. They were prepared to make further reductions when circumstances permitted. Mr. Ballard remarked that some healthy competition was wanted. The Mond Gas Company had been approached with regard to the extension of their mains to the borough; and the matter had been brought before the Dudley and District Chamber of Commerce, with the result that a circular was to be sent to the members explaining the position, and asking the recipients if they would be users of Mond gas. The Mayor (Mr. H. W. Hughes) said the best way to bring the Company to their senses would be to foster the competition of the Mond Gas Company or the electricity undertaking; but Mr. Taylor thought they should consider the question of purchasing the gas-works.

Gas-Mantle Importation Hearing Adjourned.—The first meeting of the Committee for the hearing of evidence relating to the complaint with regard to the sale of mantles for incandescent lighting manufactured in Germany, which it was proposed to hold on Wednesday, May 31, has been postponed until Thursday, June 8.

Cheaper Gas Wanted at Brierley Hill.—The Brierley Hill Urban District Council have appointed a deputation to wait on the Gas Company with a view to securing a reduction in the price of gas. For some time past there have been complaints about the present charge (5s. 6d. per 1000 c.ft.) and the quality; and hopes are entertained that the representations to be made by the Council will have the desired effect.

A Proposed Reduction Defeated.—The Skipton Gas Committee recommended the District Council last week to reduce the price of gas by 7½d. per 1000 c.ft. to slot-meter consumers, and by 7d. to ordinary meter users; the Chairman of the Committee (Mr. E. Wilson) expressing the view that the reduction could be made without affecting the financial position of the undertaking. The recommendation was opposed on the ground that the department could not afford the reductions, there having been a loss of £2600 at the end of the last financial year. The proposal was defeated by a majority of one vote.

Dukinfield Gas-Works Report.—Reporting on the balance-sheet for the year ended March 31, Mr. George Lindley, the Manager of the Dukinfield Corporation Gas-Works, says the sale of gas amounted to 89½ million c.ft., which was an increase on the previous year of over half-a-million c.ft. The unaccounted-for gas was 10·05 p.ct. of the output. The make of gas per ton of coal carbonized was 12,675 c.ft., as against 12,027 c.ft. in the year preceding. The price of gas was 5s. per 1000 c.ft. (with varying concessions for large consumptions); and there was a loss of £4219, which compares with a net profit of £41 a year ago.

Gas Production at Swadlincote.—Mr. Wragg, speaking in the Swadlincote Urban Council, referred to the good work of the Gas Manager (Mr. E. W. Wilson) in connection with the increased production of gas per ton of coal. Mr. Horman said the production of gas was not the chief trouble now. The difficulty was in disposing of it when made. The Gas Committee intended to hold a meeting to consider the matter. Mr. Goodhead (the Chairman of the Gas Committee) said they were getting more gas per ton than they had ever done before. This was due in part to the Manager, and in part to the greatly improved carbonizing plant, the whole of which had been remodelled. The amount of gas produced per ton of coal carbonized was now 3260 c.ft. more than was the case twelve months ago.

Accrington Gas-Works Extensions.—At a meeting of the Accrington Gas Board on the 11th inst., Alderman Dewhurst (the Chairman) reported that a visit had been paid to the works at Great Harwood by members of the Church District Council, and everyone was gratified with what was seen of the magnitude of the work the Board had had in hand. It would be a good thing if other constituent authorities paid a similar visit of inspection. Mr. Beckett agreed, and said he was glad the gas-works extensions were proceeding satisfactorily. The prospects were very rosy; and though at present they would have to leave the price of gas where it was, they hoped in the future some reduction would be possible. The Board and Manager were always ready to receive constructive criticism; but destructive criticism was of service to no one. Several representatives, including the Mayor of Accrington, expressed a desire to ask their Councils to visit the works.

The Directors of the European Gas Company, Ltd., have decided, subject to audit, to recommend the payment on Aug. 1 next of a final dividend of 5s. per share, free of income-tax, which, with the interim dividend paid on Feb. 1 last, will represent a total dividend of 5 p.ct., free of income-tax, for the year ended March 31 last.

Messrs. A. & W. Richards announce the sale by tender of £39,590 of 6 p.ct. redeemable debenture stock in the Grays and Tilbury Gas Company. The minimum price of issue is par; and the stock is to be redeemed at par on May 31, 1932. Offers must be received by Messrs. Richards at No. 37, Walbrook, E.C., not later than 3 o'clock to-morrow (Thursday) afternoon.

The Cinderford Gas Company announce a reduction in the price of gas of 6d. per 1000 c.ft., making it 6s. 6d., as compared with 7s. 6d. twelve months ago; and also 5 p.ct. discount to those who pay their accounts promptly, which is equivalent to another 4d. per 1000 c.ft. off. The Risca Urban District Council have decided to reduce the price of gas 9d. per 1000 c.ft.

Referring in the Church District Council to a visit to the extensions of the gas-works at Great Harwood, Mr. Lord (the Chairman) said the Manager had definitely stated that he could hold out no hope of a reduction in the price of gas during the next twelve months, owing to the enormous outlay incurred in the reconstruction work. He added, however, that some time during 1923 it might be possible to effect a reduction. As the result of the improvements made, the economy in the manufacture of gas would be not £1000 a year, but might get up to £10,000. Therefore there was good reason to hope in the near future that not only would the gas-works be in a good financial position, and provide improved working conditions, but that the consumers also would benefit.

The recent offer by tender by Messrs. A. & W. Richards of £10,856 of 6½ p.ct. redeemable preference stock and £5430 of 6 p.ct. redeemable debenture stock in the Weston-super-Mare Gas Light Company, was very successful. For the preference stock, tenders were sent in for a total of £19,300, and ranged from £104 per £100 down to the minimum of par; the stock being allotted at an average of £100 19s. 11d., yielding to the investor £6 7s. p.ct. For the debenture stock, tenders were sent in for £42,160, and ranged from £104 down to the minimum of £99; the stock being allotted at an average price of £102 7s. 9d., yielding to the investor £5 13s. p.ct. The issue of the Lowestoft Water and Gas Company's £60,000 6 p.ct. redeemable debenture stock was also considerably oversubscribed; the tenders ranging from £105 down to the minimum of par. The stock was allotted at an average price of a little over £101 p.ct.

STOCK MARKET REPORT.

THE chief incident of the week on the Stock Exchange was the repeal of the restrictions upon dealings imposed since the outbreak of the war, and the resumption of normality. Business generally was very quiet, and the prevailing tone of most markets decidedly dull.

Business in the Gas Market, however, was unsympathetic, and ran its course joyously. Activity would have been greater but for the indisposition of holders to part with their shares in so buoyant a market. The general advance in prices continued in great strength. In the London companies, Gas Light Ordinary rose 1, ditto maximum 2, Commercial 4 p.ct. 2, ditto 3½ p.ct. 4. In Suburban and Provincials, British debenture rose 10, Ilford debenture 10, Southampton 5, Tottenham "A" 2, ditto "B" 6, Wandsworth "A" 16, ditto "B" 12, ditto "C" 3, ditto Wimbledon 10, ditto Epsom 15. In Continental, European rose 1½. In the remoter world, Bombay rose ½, Oriental 3½, Cape Town shares ½, ditto debenture 10, Hong Kong and China 1.

The following transactions in gas during the week were recorded: On Monday, Alliance and Dublin 65, 65⅜, Brentford debenture 79, Commercial 3½ p.ct. 92¼, Continental Union 39, European 12⅝, 12 13/16, 12⅞, 13, Gas Light ordinary 94½, 94⅜, 95, 95½, 95⅝, 95½, 95⅜, 96, 96⅛, 96⅜, ditto maximum 65, 65⅜, 65½, ditto debenture 65½, 66½, Imperial Continental 169½, 170½, Primitiva preference 53s. 9d., 55s., South Metropolitan 95½, 95⅝, 96, 96⅛, ditto debenture 67½, ditto 6½ p.ct. debenture 105⅞, 106, 107, Wandsworth "B" 81, Swansea 7 p.ct. preference 102, 102½, ditto 6½ p.ct. debenture 105, 105⅜. On Tuesday, Alliance and Dublin 65⅛, 65⅜, 65⅝, Bournemouth "B" 9⅞, 9 15/16, Brentford "A" 92, ditto debenture 80, Commercial 4 p.ct. 90, 91, 91½, European 12½, 13, £13 1s. 9d., Gas Light ordinary 95⅜, 96, 96⅛, 96⅝, 96¾, 97, ditto maximum 65⅛, 66, 66⅛, 67, ditto preference 81, ditto debenture 65, 65⅛, Imperial Continental 169, 170, Lea Bridge 85⅛, Primitiva 18s., 19s. 6d., ditto preference 53s. 9d., 55s., 55s. 6d., 55s. 7½d., 57s. 6d., ditto debenture 72, South Metropolitan 95⅛, 97, ditto 6½ p.ct. debenture 106⅜, 107, Tottenham "B" 99⅜, 100, Swansea 7 p.ct. preference 101½, 101⅜, 102½, ditto 6½ p.ct. debenture 105½, Liverpool 7 p.ct. preference 106⅜. On Thursday, Brentford "B" 93½, 94½, Buenos Aires 58⅜, Commercial 4 p.ct. 91⅜, 92, ditto 3½ p.ct. 94½, European 13⅜, 13 3/16, 13⅜, 13⅜, Gas Light ordinary 96½, 96⅜, 97¼, ditto maximum 66½, ditto preference 81, Imperial Continental 163½, 164, 164½, 165½ Primitiva 15s., 16s., ditto preference 45s., 46s. 3d., River Plate debenture 58, South Metropolitan 96½, 97, ditto 6½ p.ct. debenture 106 3/16, 106½, Tottenham "B" 99⅜, 100, 100½, Wandsworth "B" 86, Swansea 7 p.ct. preference 101½, 102½, ditto 6½ p.ct. debenture 105, Hornsey 5 p.ct. preference 90, 90½. On Friday, Alliance and Dublin 65⅜, Brighton and Hove "A" 122, 122½, Commercial 4 p.ct. 92½, 93, Continental Union 37, European 13½, Gas Light ordinary 95½, 95⅜, 96, 96⅛, 96⅛, 96¾, 97, ditto maximum 65½, ditto debenture 64⅜, 65, Imperial Continental 163½, 164, 165½, Primitiva preference 48s. 9d., South Metropolitan 96, 96⅛, 97, ditto 6½ p.ct. debenture 106, 106½, South Suburban debenture 94, Tottenham "A" 114, 115, ditto "B" 100, 100½, Swansea 7 p.ct. preference 102, ditto 6½ p.ct. debenture 105½, Richmond 5 p.ct. 75, Watford 7 p.ct. debenture 102.

In the Money Market, the position continued to be quite easy. The Bank rate is 4 p.ct., as fixed on April 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mch. 15	4	4%	Aldershot 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Apl. 12	2½	3 1/16%	Alliance & Dublin Ord.	59—64	62—67	65—65⅛
374,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	62—6	...
280,000	5	May 18	7½	4/-	Bombay, Ltd.	5⅞—6⅛	4⅛—5*	4⅛
100,000	5	Feb. 23	16	7½%		..	10½—11⅛	...
383,110	10	,,	7	7%	Bournemouth Gas and Water { 5 p.c.	..	..	..
115,000	10	,,	6	6%	{ B 7 p.c.	15—15⅛	9—10	9⅞—9 15/16
162,065	—	Dec. 30	—	4%	{ Pref. 6 p.c.	13½—14	8—9	...
992,045	Stk.	Feb. 9	14	56/-	{ 4 p.c. Deb.	..	65—70	...
734,920	,,	,,	11	55/-	Brentford A Consolid.	261—266	88—93	92
55,000	,,	,,	5	5%	Do. B New	204—209	88—93	93⅛—94⅛
221,400	,,	Dec. 15	4	4%	Do. 5 p.c. Pref.	109—111	80—85	...
214,775	,,	Mch. 15	11	11½%	Do. 4 p.c. Deb.	91—93	75—80	79—80
244,200	,,	,,	8	8½%	Brighton & Hove Orig.	208—213	165—170	166
1,287,500	Stk.	July 28	5	5%	Do. A Ord. Stk.	154—159	118—123	122—122½
530,000	20	Mch. 15	12½	10%	Bristol 5 p.c. max.	..	..	...
120,000	Stk.	Dec. 30	4	4%	British	44—45	29—31	...
245,771	,,	,,	4	4%	Do. 4 p.c. Deb. Stk.	88—90	78—82	...
100,000	10	May 27	—	7%†	Buenos Aires 4 p.c. Deb.	85—87	55—60	58⅛
100,000	10	Apl. 27	—	4½%	Cape Town & Dis., Ltd.	1½—2½	6⅛—7⅛	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Pref.	4—6	5⅛—6⅛	...
157,150	,,	Feb. 26	5	5%	Do. 4½ p.c. Deb. Stk.	70—75	75—80	...
1,513,280	,,	Mch. 15	5/9/4	42/8	Chester 5 p.c. Ord.	108—110	..	...
560,000	,,	,,	5⅛	38/4	Commercial 4 p.c. Stk.	106—108	90—95	90—93
475,000	,,	—	3	3%	Do. 3½ p.c. do.	103—105	92—97	92⅛—94⅛
800,000	,,	Dec. 15	4	—	Do. 3 p.c. Deb. Stk.	69½—71½	57—62	...
200,000	,,	,,	7	—	Continental Union, Ltd.	76—79	37—42	37—39
51,600	,,	Feb. 23	15	15%	Do. 7 p.c. Pref.	115—118	50—55	...
278,400	—	,,	12	12%	Croydon A 10 p.c.	..	185—195	...
492,270	Stk.	—	6	4½%	Croydon B and C 7 p.c.	..	145—155	...
55,000	,,	—	4	4%	Derby Con. Stk.	123—125	80	...
1,002,180	10	Jan. 26	10	5/0	Do. Deb. Stk.	102—104	65	...
16,298,975	Stk.	Feb. 23	4/17/4	46/8	European, Ltd.	17½—18	13⅛—13⅜	12⅛—13⅜
2,600,000	,,	,,	3½	35/-	Gas Light { 4 p.c. Ord	98—102	95—96	94⅛—97⅛
4,062,235	,,	,,	4	4%	{ 3½ p.c. max.	76—79	65—68	65—67
4,674,850	,,	Dec. 15	3	3%	and { 4 p.c. Con. Pref.	96—99	80—83	80⅛—82
130,000	,,	Dec. 11	10	10%	Coke { 3 p.c. Con. Deb.	72⅛—74⅛	63—66	64⅛—66⅛
82,500	,,	Sept. 14	5	3½%	{ 10 p.c. Bonds	..	..	...
258,740	,,	Mch. 15	3½	2⅛%	Hastings & St. L. 5 p.c.	..	..	...
70,000	10	May 18	11	5%	Do. 3½ p.c.	87—89	52—57	...
86,600	Stk.	Mch. 15	9	9½%	Hongkong & China, Ltd.	16½—16⅛	6—7*	...
131,000	,,	,,	7⅛	7½%	Hornsey 7 p.c.	..	100—105	...
65,780	,,	,,	6⅛	5⅛%	Ilford A and C	151—154	120—130	...
65,500	,,	Dec. 30	4	4%	Do. B.	115—118	100—110	...
1,976,000	,,	May 18	9	5%	Do. 4 p.c. Deb.	92—94	75—80	...
404,800	,,	Feb. 9	3½	3⅛%	Imperial Continental	150—160	162—167*	163½—170½
235,242	,,	Mch. 15	6½	6½%	Do. 3½ p.c. Deb. Red.	84—86	72—77	...
2,498,905	,,	Feb. 26	10	37/6	Lea Bridge Ord. 5 p.c.	119—121	83—88	85⅛—86⅛
306,083	,,	June 26	4	4%	Liverpool 5 p.c. Ord. { A.	211—213	..	...
165,736	,,	Feb. 23	7/5/6	6%	{ B.	146—148	..	...
63,480	,,	Dec. 30	—	3%	Do. 4 p.c. Pr. Deb. Stk.	..	..	...
75,000	5	June 11	6	3%	Maidstone 5 p.c.	..	80—85	...
250,000	100	Apl. 3	4½	4½%	Do. 3 p.c. Deb	..	48—51	...
541,920	Stk.	Nov. 30	4	4%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4⅛—4⅜	2⅜—3⅜	...
1,875,892	,,	Feb. 23	4½	4½%	Monte Video, Ltd.	99—101	91—98	...
529,705	,,	Dec. 30	3⅜	3⅜%	Newcastle & Gatsh'dCon.	11⅛—12	65—70	...
15,000	10	Aug. 26	—	7/6	Do. 3½ p.c. Deb.	98½—99½	81⅛—82½	...
55,940	10	Mch. 15	7/14/0	10/15	North Middlesex 10 p.c.	82—83	69—71	...
300,000	Stk.	May 18	8	8%	,, ,, 7 p.c.	..	12⅜—13	...
60,000	5	—	10	—	Oriental, Ltd.	14—15	10—11	...
188,120	Stk.	Dec. 30	—	6%	Ottoman, Ltd.	117—122	90—95*	...
60,000	50	Mch. 15	13	62/6	Plym'th & Stonh'se 5 p.c.	7⅛—7⅞	2—3	...
100,000	50	,,	12	57/6	Portsea Island, B	..	69—71	...
249,980	5	—	8	—	Do. C	128—131	87—90	...
499,960	5	—	5	—	Primitiva Ord.	118—121	78—83	...
521,600	100	Dec. 1	4	4%	Do. 5 p.c. Pref.	5⅛—6	⅜—1	15/—19/6
600,000	Stk.	Jan. 26	4	4%	Do. 4 p.c. Deb.	4⅛—5	2⅛—2⅜	46/3—57/6
346,198	,,	Dec. 30	4	4%	Do. ,, ,, 1911	91—93	70—75	72—73⅛
150,000	10	Mch. 30	6	6/-	River Plate 4 p.c. Deb.	..	55—60	...
125,000	50	Jan. 3	5	5%	San Paulo { 6 p.c. Pref.	85—87	55—60	58
135,000	Stk.	Mch. 15	10	5%	{ 5 p.c. Deb.	10⅛—11	5⅛—6⅛	...
209,984	,,	,,	10	5%	Sheffield A	47—49	36—39	...
523,500	,,	,,	10	5%	Do. B	223—224	89—92	...
133,201	Stk.	Sept. 15	4	4%	Do. C	222—224	89—92	...
90,000	10	Oct. 28	9	8%	Shrewsbury 5 p.c.	220—222	89—92	...
6,609,895	Stk.	Feb. 9	5/4/0	5%	South African	..	..	...
250,000	,,	Jan. 12	—	5%	South Met Ord.	10⅛—11⅛	7—9	...
1,895,445	,,	,,	3	3%	Do. Red. Pref.	111—113	95—98	95⅛—97
224,820	,,	Feb. 23	8⅛	8⅛%	Do. 3 p.c. Deb.	72⅛—74⅛	96—98	...
1,087,795	,,	,,	6	5⅛%	South Shields Con. Stk.	157—159	60—63	61⅛
368,837	,,	Dec. 30	5	5%	S'th Suburb'n Ord. 5 p.c.	114—116	106—108	...
647,740	,,	May 18	5	4%	Do. 5 p.c. Deb. Stk.	116—118	97—102	100⅛—103
121,275	,,	Dec. 30	4	4%	Southampton Ord.	99—102	90—95	94
120,000	,,	Feb. 23	—	7⅛%	Do. 4 p.c. Deb. Stk.	..	63—68*	...
782,275	,,	,,	6	5⅛%	Tottenham { A 5 p.c.	135—138	60—62	...
181,255	,,	Dec. 15	4	4%	District { B 3½ p.c.	115—117	112—117	114—115
182,380	10	Dec. 30	5	—	{ 4 p.c. Deb.	87—89	98—103	99⅛—100⅛
149,900	10	July 1	5	5%	Tuscan, Ltd.	5—6	77—82	80
236,476	Stk.	Mch. 15	5	3⅛%	Do. 5 p.c. Deb. Red.	93—95	1—2	...
					Tynemouth 5 p.c. max.	108⅛—109	45—50	...
30,000	,,	Mch. 15	8⅛	66/3	Wandsworth, Wimbledon, and Epsom—		68—70	...
255,636	,,	,,	6⅛	51/3	Wandsworth A 5 p.c.	151—156	105—110	...
108,075	,,	,,	—	46/4⅛	Do. B 3½ p.c.	129—134	90—95	81—86
140,865	,,	,,	—	46/4⅛	Do. C.	..	78—83	...
352,000	,,	,,	6⅛	45/-	New Ordinary	..	75—80	...
98,000	,,	,,	6⅛	50/-	Wimbledon 5 p.c.	117—122	85—90	...
88,416	,,	Dec. 30	3	3%	Epsom 5 p.c.	121—126	90—95	...
					3 p.c Deb. Stk.	66—69	53—56	...

* Ex Div. † Next dividend will be at this rate.

STOCKS AND SHARES.

WELLINGTON (SALOP) GAS COMPANY.

INCORPORATED BY ACT OF PARLIAMENT.

ISSUE OF £13,500

6½ P.CT. REDEEMABLE PREFERENCE STOCK

(MINIMUM PRICE OF ISSUE, £100 PER £100 STOCK).

REDEEMABLE AT PAR, JUNE 30, 1932.

THE Directors of the Wellington (Salop) Gas Company are prepared to receive, not later than Friday, June 9, 1922, TENDERS for the above Stock.

Tenders, which must be for not less than £50 of Stock and in multiples of £10, should be made on the prescribed Form, addressed to the undersigned, and endorsed "Tender for Preference Stock."

Copies of the Prospectus and Form of Tender can be obtained on Application to me or to the Manager at the Company's Offices, Market Street, Wellington, Salop.

R. A. NEWILL,
Secretary and Solicitor.

Church Street, Wellington,
Salop.

By Order of the Directors of the

BURGESS HILL AND ST. JOHN'S COMMON GAS COMPANY.

SALE OF REDEEMABLE PREFERENCE STOCK.

MR. HORTON LEDGER, F.A.I., has been favoured with instructions to SELL BY AUCTION at the Colonnade Auction Mart, 157, North Street, Brighton, on Tuesday, June 13, 1922, at Three o'clock.

£2500 REDEEMABLE PREFERENCE STOCK,

bearing Interest at the rate of 7 per Cent., in the BURGESS HILL AND ST. JOHN'S COMMON GAS COMPANY.

Particulars and Conditions of Sale can be obtained of the COMPANY, LONDON ROAD, BURGESS HILL, C. H. JAMES, Esq., Solicitor, BURGESS HILL, and 4, GRAND PARADE, BRIGHTON, or of the AUCTIONEER, at the COLONNADE AUCTION MART, 157, NORTH STREET, BRIGHTON. Telephone: 88 Brighton.

HEAD, WRIGHTSON, & CO., LD., for BOILERS, &c. T. & J. UTLEY, LTD., CORNBROOK MANSIONS, 24, VICTORIA STREET, S.W. 1. MANCHESTER.